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THE NEW INTERNATIONAL ENCYCLOPÆDIA

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VOLUME VII

NEW YORK
DODD, MEAD AND COMPANY
1903

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The University Press, Cambridge, U. S. A.

ILLUSTRATIONS IN VOLUME VII.

COLORED PLATES

Facing Page
Europe — White Races 60
Ferns 312
Fishes, American Food 430
Flags — Merchant Flags of Maritime Countries 460
Flags — Merchant Flags of Maritime Countries 460
Flags — United States Flags 462
Flavoring Plants 476
Fraternities, College 758

MAPS

Europe 44
Europe, Physical Map 46
Europe {At the time of Charlemagne, 843
About 1500} 50
Europe {At the time of Napoleon's Greatest Power, 1812
After the Congress at Vienna, 1815} 56
Florida 508
Forests in the United States 602
France 694
French Indo-China 798
Frost, First Killing 858
Frost, Last Killing 860

ENGRAVINGS

Eucalyptus 28
Falcons and Falconry 202
Faraday, Michael 222
Field Artillery 352
Firs 396
Fire Engine 400
Fire Engine 402
Fireproof Construction 412
Fire Protection 416
Fire Protection 416
Fishing Birds 444
Flatfish and Flounders 474
Florence 502
Flour 516
Flour 518
Flowers 520
Flycatchers, Typical 536
Fortification 632

FACING PAGE
FORTIFICATION 634
FORUM, ROMAN 648
FOXES AND JACKALS 682
FRANKLIN, BENJAMIN 746
FREDERICK THE GREAT 768

KEY TO PRONUNCIATION.

ā	as in ale, fate.
a̍	“ “ senate, chaotic.
â	“ “ glare, care.
ă	“ “ am, at.
ä	“ “ arm, father.
ȧ	“ “ ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a	“ “ final, regal, where it is of a neutral or obscure quality.
a̤	“ “ all, fall.
ē	“ “ eve.
e̍	“ “ elate, evade.
ĕ	“ “ end, pet. Also for *ä* in German, as in Gräfe, to which it is the nearest English vowel sound.
ẽ	“ “ fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Örtel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	“ “ agency, judgment, where it is of a neutral or obscure quality.
ī	“ “ ice, quiet.
ı̍	“ “ quiescent.
ĭ	“ “ ill, fit.
ō	“ “ old, sober.
o̍	“ “ obey, sobriety.
ô	“ “ orb, nor.
ŏ	“ “ odd, forest, not.
o	“ “ atom, carol, where it has a neutral or obscure quality.
oi	“ “ oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	“ “ food, fool, and as *u* in rude, rule.
ou	“ “ house, mouse.
ū	“ “ use, mule.
u̍	“ “ unite.
ŭ	“ “ cut, but.
ụ	“ “ full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	“ “ urn, burn.
y	“ “ yet, yield.
B	“ “ the Spanish Habana, Cordoba, where it is like a *b* made with the lips alone, instead of with the teeth and lips.
ch	“ “ chair, cheese.
D	as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	“ “ go, get.
G	“ “ the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
H	“ “ *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	“ “ *wh* in which.
K	“ “ *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate towards which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	“ “ sinker, longer.
ng	“ “ sing, long.
N	“ “ the French bon, Bourbon, and *m* in the French Étampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce “onion” without touching the tip of the tongue to the roof of the mouth.
sh	“ “ shine, shut.
th	“ “ thrust, thin.
TH	“ “ then, this.
zh	“ “ *z* in azure, and *s* in pleasure.

An apostrophe, or superior comma, ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā′b'l (table), kaz′'m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to ensure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

ETH′ICS (Gk. *τὰ ἠθικά*, *ta ēthika*, or *ἡ ἠθική*, *hē ēthikē*, ethical science, from *ἦθος*, *ēthos*, custom, habit). The science of morality. There has been much discussion as to whether it is really a science or not rather a branch of philosophy. The present article is written in the belief that ethics is as independent a science as economics or political theory. Many arguments have been adduced to prove that scientific ethics is impossible; but they are not in themselves convincing, and even if they were more plausible they would not convince any one who had before him the accomplished fact of a scientific ethics. Such we have in the treatises of Stephen, Alexander, and Wundt, to mention only a few recent authors.

In the definition given above the subject matter of ethics is stated to be morality. It is important to notice that ethics does not presume to construct morality out of whole cloth. Like any other science, it deals with actual phenomena that exist before the science comes into being. If there were no such thing as morality in the world, if men had not a consciousness of obligation, did not feel the attractive power of moral ideals, and did not find satisfaction in the realization of these ideals, ethics would not be, any more than mineralogy would be in a non-mineral world. But since morality is as indubitable a fact as crystallization, it piques curiosity to the comprehension of it. Among the questions that arise are the following: What is morality? Is it explicable as a result of evolution? When thoroughly understood in its fundamental features and in its historical development, is it seen to be a reasonable fact, or is it a prejudice to be outgrown or an infantile way of looking at the world, to be put away with many other childish things when once we arrive at the age of discretion? If it is something of permanent value, is there any way in which its value may be enhanced?

It is necessary to be on our guard when we come to ask what morality is. The question is often confused with that other question—What ought morality to be? This latter question, however, cannot be reasonably answered till the former is answered, any more than the question what ought a healthy man to be can be answered till we know what actual health really is. The morality of a certain man, or of a certain people, or of a certain time, is itself amenable to a higher standard of morality only in a sense that actual empirical healthfulness is amenable to a higher standard, idealized from experienced health. But what is that standard? Here we come to a point concerning which there is a fundamental difference of opinion. Some say the standard is God's will (theological voluntarism); some that it is pure reason (rationalism); some that it is pleasure, either of the individual or of a community of individuals (hedonism, egoistic and universalistic); some that it is perfect biological adaptation to the environment (biologism); some that it is perfection, variously defined, of the individual or of the race (perfectionism). In view of this difference of opinion, it seems impossible to answer off-hand the question what morality ought to be. But the question what morality is and has been is more hopeful. Although the moral consciousness is anything but simple, still it is open to study and description.

In the first place, the form or type of moral consciousness we are best acquainted with is one that is capable of appreciating an antagonism between two or more motives. If there were never a competing desire standing out against the safe course always adopted, or, to use the language of religious experience, if there were no temptations, there would be no morality such as we know it. This feature will be discussed below.

The second characteristic of mature moral consciousness, is that without the capacity for self-consciousness it could not exist. The motives in the moral consciousness are not merely desires for this and that object, but desires which may be considered by the agent as indicating his own character. The significance of this feature of morality can be brought out better by comparing the consciousness of a presumably non-moral being with that of a moral being. A cat may desire a warm berth on a bed, and may be averse to the whipping that comes to her when caught on the bed. Now, of course, we know nothing infallibly about a cat's thoughts, but for the present argument such knowledge is not necessary. It is only necessary to know that *if* we knew that the cat did not think of herself as we do of ourselves; if we knew that before acting she could not present to herself an idea of herself as acting in one way, and then an idea of herself as acting in the other way, we should not treat her as a moral being. If, on the other hand, we knew the contrary, we should be tempted to take a different moral attitude toward her.

A third characteristic of moral consciousness is that the idea of self as doing or being has a motive value. It attracts or repels. Not only does the moral agent have at times the idea of himself as doing this thing or not doing it, but he likes or dislikes the idea of himself as doing or not doing it. Such an idea of self which attracts the agent to realize it in act is called an ideal self.

But not all our ideals are moral, so that the account we have as yet given of the moral consciousness is not adequate. We have perhaps already sufficiently covered the generic features of developed morality, but its specific features have not been recounted. The definition of a moral agent as an agent with an ideal self, an end which excites desire, and enters into competition with other ends, leaves out of account the social nature of morality, the fourth characteristic to be mentioned. Indeed, the social character of morality is so important that many writers have gone so far as to identify morality with sociality.

In this, as in other extreme views, there is an element of truth, and in this case that element is of the most momentous import. The ideal, to be ethical, must be a social ideal. That is, the idea of self which is the end of action is in morality and immorality the idea of a self in essential relation to other selves. Man, as Aristotle wisely observed, is by nature a social animal, and human morality is social to the core. Whether any other morality is possible is not here in question. We are now trying to describe the morality we know, which gets one of its most distinctive features from man's social nature. This is made evident by an appeal to the religions, in which morality comes to partial expression; the codes of all great religions deal largely, if not almost entirely, with social duties. Confucian, Buddhist, Hebraic, Christian, and Mohammedan prescriptions for regulating conduct consist in large measure of rules regulating social intercourse. Historical morality is social; and when we say that it is social, we say that it is in a sense objective. It is not a matter of the individual's arbitrary construction. He does not choose his ideal entirely at his good pleasure. He finds a general ideal in the society into which he is born and in which he is reared, and this ideal forms at least the point of departure for his own mature ideal. There are certain things expected of a member of society, and this expectation forms a nucleus around which the individual ethical development proceeds. The moral man does not break away completely from these traditions. A complete breach with the observances of his community would at once stamp a man as immoral. And here again, let it be noticed, we are not asking whether it ought to be so, but merely whether it is so. We must repeat that we cannot tell what morality ought to be until we have discovered what it actually is, and the actual fact is that the moral man is one who is "centered in the sphere of *common* duties."

Another feature of morality needing mention is that these common duties have in most cases a real or assumed reference to the welfare of the community. The obvious reason for the condemnation of murder, adultery, rape, theft, lying, cowardice, and intemperance, to mention some of the most prominent objects of moral judgment, is that these acts are injurious to society. The murderer, the adulterer, the ravisher, the thief, the liar, the coward, and the intemperate are common enemies, and the disapproval they receive is, at least in part, the natural reaction of society against its foes. That in great measure morality is action really or supposedly conducive to social welfare, and immorality is action really or supposedly conducive to social degeneration, is proved by the fact that actions once regarded as ethically indifferent come to be regarded as moral or immoral when the general opinion comes to regard them as socially beneficial or injurious. The gradual change in the moral status of slavery, of concubinage, of general sexual laxity in men, of the duel and the vendetta, is historically traceable to growing insight into the social consequences of these practices. The process of the moralization of formerly ethically indifferent acts is observable in our own day. In many places lynching is morally justified by the community at large. The mob law exercised on some dastard criminal is considered moral because it not only 'serves him right,' but also is supposed to protect society against future outrages. But when it is seen that such protection does not protect, but tends to undermine the very foundation of law, and thus render society insecure, a sentiment grows that lynching is morally wrong. The sentiment lags behind the insight, but it follows it, even though at some distance. Not only is it true that obviously injurious actions are morally condemned, but supposedly injurious actions are likewise condemned. It is thus patent that real or presumed relation to social welfare is a constituent element in morality. It should be remarked here that nothing has been said of the size of the community with whose welfare morality is bound up. Anthropology teaches that in primitive communities moral obligation has no reference to anything outside of the family, the clan, or the tribe. Even at the present day many a man who would not think of swindling a neighbor may have no scruples when it comes to taking advantage of a foreigner, especially if the foreigner be of a nationality utterly alien to his own. The community within which moral relations are recognized need not be in any sense one of blood relationship. It may be one of trade or calling, or it may be some quite artificial fraternity. All this goes to show that actual morality is not catholic and cosmopolitan, but is apt to be cliquish and clannish, and the size of the community involved is determined by various causes. But these facts do not make against the statement that moral consciousness, wherever found, is the consciousness of social import, or of an ideal self who takes delight in and works for the welfare of some fellow-beings organized together in some way.

We have as yet left out of account what probably many would regard as the most distinctive feature of morality—the consciousness of *obligation*. Thus, it is alleged, however erratic from our point of view modes of conduct approved in foreign lands and in past ages may be, some definite course of conduct has always been regarded as binding. The fact of the obligation of some act or another, it is asserted, is, and has always been, recognized by every human being. There is the *form* of imperativeness, so the contention runs, in all human consciousness; this constitutes the framework of morality. The content, the matter, of morality varies indefinitely; the form is immutable. Some such thought as this controlled the mind of Socrates in his attempt to disprove the doctrine of relativity (q.v.), as applied by the Sophists (q.v.) to the ethical life. Plato at times hypostatized this immutable essence of morality into the eternal "form of the good." Aristotle, doing justice to another type of moral experience, found morality to consist in certain obligations imposed by the desire to secure certain ends. Christian theology, following Saint Paul, construes it as God's law of righteousness—"that which may be known of God" and "is manifest even in the Gentiles, for God manifested it unto them" (Rom. i.). "For when the Gentiles, which have not the law, do by nature the things contained in the law, these having not the law are a law unto themselves; which shew the work of the law written in their hearts, their conscience also being witness, and their thoughts the meanwhile accusing or else excusing one another" (Rom. ii. 14, 15). Ethical intentionism (q.v.) takes its cue from traditional theology, and finds a 'faculty' of conscience in every man; a faculty which may become atrophied in those who stiff-neckedly refuse to give it play, but which is an always present element in the original equipment of faculties possessed by every man. Ethical rationalists (see RATIONALISM), of whom Kant is the great protagonist, ascribe to pure reason an invariable mandatory activity, which operates in every rational being to the production of a recognized obligation to do certain things and to leave certain things undone, just because this doing and this leaving undone is pure reasonableness. In Kant this demand of pure reason is formulated in the principle, "Act only on that maxim whereby thou canst at the same time will that it should become a universal law." This he calls the "one categorical imperative." This "law contains no conditions restricting it;" it "is objectively necessary in itself without reference to any purpose." It has its seat and origin completely *a priori* (q.v.) in the reason, and that, moreover, in the commonest reason just as truly as in that which is in the highest degree speculative; "it is just the purity of" its "origin that makes" it "worthy to serve as our supreme practical principle." "There is no genuine supreme principle of morality but" this which rests "simply on pure reason, independent of all experience." Hedonism (q.v.) roots the universal, unvarying form of morality in the desire of every sentient being to secure pleasure. In what Professor Sidgwick calls the psychological form of hedonism, the view is held that "on the occasion of every act he exercises, every human being is led to pursue that line of conduct which, according to his view of the case, taken by him at the moment, will be in the highest degree contributory to his own greatest happiness" (Bentham). In the ethical form of hedonism it is conceded that "men often, from infirmity of character, make their election for the nearer good, though they know it to be the less valuable; and this no less when the choice is between two bodily pleasures than when it is between bodily and mental." But while men thus do choose the less valuable pleasure, "it may be questioned whether any one who has remained equally susceptible to both classes of pleasure ever knowingly and calmly preferred the lower." Happiness is "the rational purpose of human life and action" (J. S. Mill). The happiness which reason prescribes as the proper end of life may be conceived as one's own happiness (egoistic ethical hedonism), or it may be the happiness of all sentient creatures (universalistic ethical hedonism). But however narrowly or broadly conceived, reason is said to demand an effort to secure it and thus to impose an obligation. Perfectionists claim that what is demanded is not happiness, but the full, harmonious development of one's nature and of the nature of one's fellows, until we all attain unto the stature of the perfect man. Certain evolutionists consider the supreme end which imposes obligation to consist in improvement of 'the social tissue' (Leslie Stephen). In all these views it will be seen there is an insistence upon the fact that obligatoriness is an essential mark of morality. Though they differ widely as to the source of obligation, they all agree that coextensive with morality is the phenomenon of obligation. On the other hand, we find some writers who maintain that obligation is only an accident of morality. Herbert Spencer, in his *Data of Ethics*, comes to the "conclusion, which will be to most very startling, that the sense of duty or moral obligation is transitory and will diminish as fast as moralization increases." "With complete adaptation to the social state, that element in the moral consciousness which is expressed by the word obligation will disappear. The higher actions, required for the harmonious carrying on of life, will be as much matters of course as are these lower actions which the simple desires prompt. In their proper times and places and proportions, the moral sentiments will guide men just as spontaneously and adequately as now do the sensations." Among the poets this view is by no means rare.

These two opposing interpretations of morality—the one that regards the consciousness of obligation as indispensable to morality, and the one that regards it as a transitory feature which will be outlived—are each in part true and in part false. The facts warrant us in saying that it is not necessary to the morality of an act that the agents should regard it as obligatory. Of actions which, except upon some preconceived theory, no one would hesitate to pronounce moral, a large proportion is spontaneous or habitual. A cup of cold water, even when not given "in the name of a disciple," or of the giver's or the recipient's "pleasure," or of "the greatest happiness of the greatest number," or of "the social tissue," or of somebody's "perfection," or of "the moral sense," or of "a universal law of Nature," may yet change hands in an unquestionably moral act. What is required to make the gift moral is that it should be made by a moral agent—i.e. by one who is *capable* of the consciousness of obligation, and that it should not be regarded by him as a contravention of moral obligation. Not the presence of the consciousness of moral obligation, but the absence of the consciousness of disloyalty to a moral obligation and the ability of the agent to feel an obligation, is a universal feature of moral conduct. Even the uneasy consciousness of disloyalty to a traditionally recognized moral obligation is compatible with morality, provided the agent has come to recognize an obligation superior to the traditional; for his habitual reverence for the old law and the knowledge that he is drawing on himself the opprobrium of its adherents may fill him with vague misgivings at the very time when his conduct is prompted by fealty to the new order. He acts against the *feeling*, while acting in harmony with the *knowledge*, of moral obligation. Such action, instead of being immoral, or even non-moral, is a supreme instance of moral heroism. But when the path of duty has been worn smooth by habit, the wayfarer thereon is none the less moral because for the most part he forgets the manner of path he is treading. In the soldier who has been, through severe discipline, habituated to obedience, the sense of coerciveness has disappeared. The soldier may no longer be explicitly conscious that some other person exacts of him a certain mode of behavior. In general, he may no longer exact this of himself. It has become his nature to do this, and that is all there is to it. But often, again, that is not all. There come times when his nature does not prompt him without hesitation. Then the question arises, 'What ought I to do?' This need not mean, 'What must I do to escape the guardhouse?' There may no longer be a consciousness of subordination to some external authority, in the sense of some person or some organization that actually demands compliance with certain rules. And yet there is not the sense of freedom to do anything one may like. Something still *ought* to be done and something *ought not* to be done. If, however, habit should have altogether become blind second nature, if the agent should have outlived the ability to think in terms of obligation, his action would have lost that one distinguishing mark which differentiates morality from what appears to be the non-benevolent coöperative beneficence of ants. If morality is to be a term having any specific meaning, it must be saved from application to a condition of affairs in which an idea of obligation is never present any more than are "the evils of starvation at a time when a healthy appetite is being satisfied by a meal" (Spencer). Our conclusion, therefore, is that acts not recognized as obligatory may be moral if performed by beings capable, on due occasion, of recognizing them as obligatory.

But what is the consciousness of obligation? In how many forms does the consciousness of obligation appear? What gives rise to these various forms? How does moral obligation differ from other obligations? All these questions demand answer in a systematic ethical discussion.

Let us answer the first question by saying that no single definition can be given of obligation. Rather is it true that there are at least two quite different types of the consciousness of obligation, each of which must be described in its own way. Following Kant, we may call these two types the categorical and the hypothetical. In the latter case a person is conscious that he ought to do a thing if he wants to secure a certain end: in the other he judges that he ought to do a thing, without being able to assign any end as the necessary means of obtaining which the action is obligatory.

Taking up first the consciousness of conditional obligation, which is called the hypothetical imperative, we find that the complex mental process can be described as follows: 'I want a certain result; and I judge that a certain act is indispensable if I am to secure that result. Therefore I am conscious that in so far as I am motived by the desire and directed by my judgment I must in consistency perform the act.' The fact that when a certain desire and a certain judgment respecting the means of satisfying this desire are present in consciousness a certain act is required for consistency's sake, is the fact of hypothetical or teleological obligation. When I experience that requirement in my consciousness I say that I ought to do that act. Man as desiring and as not securing a certain object is man at odds with his environment. Man as desiring and yet as not doing what he knows to be necessary to secure a certain object is man at odds with himself. He is inconsistent. His action does not comport with his desire, and because he knows that there is this incompatibility his action does not comport with his knowledge. It is unintelligent and irrational. The irrationality of the act is concrete and not abstract. It consists in incongruousness with a known definite situation. Vary the situation, and the demand of reason or the obligation varies likewise. The obligation is contingent, because reason itself alone cannot create it. But given a desire and a knowledge of some means to gratify it, and there always is in a thinking being, just so far as he thinks, the consciousness of the incompatibility between the existence of the desire and a failure to perform the act known to be a necessary means of satisfying the desire. In case there are two desires, and the necessary measures to be taken to appease them cannot both be taken, there arises a conflict of obligation. This conflict is adjusted only when one desire has become superior to the other. Then its corresponding obligation becomes superior also. Reason takes into consideration the ascendency of this desire, and in this concrete situation decides in favor of that conduct which this desire imposes. Often the part played by reason in the conflict of obligations is still greater, for it often happens that the relative strength of a desire is modified by knowledge of the results that follow its gratification. Its nature as desire is not changed; it does not cease to be desire because it is modified by knowledge of consequences. But as a desire which is the function of reasoned knowledge, it is a concretely rational desire. Now, in the case of a conflict of obligations, it happens frequently that a concretely rational desire is stronger than random desires, and its correlative obligation is supreme over competing obligations. In such a case we have in the fullest sense a supreme reasonable obligation, which, however, is after all conditional or teleological.

But there are obligations which are categorical. Often we do not say to ourselves, 'Do this because you want that,' but merely, 'Do this.' There arises in consciousness a command saying 'Thou shalt,' or 'Thou shalt not,' and often this commandment is recognized as having rightful authority. How does this command arise?

To some extent, without question, it arises by reason of an economical tendency to abbreviation, characteristic of all mental processes. We begin by saying to ourselves, 'Do this, because you want that,' and we end by saying shortly, 'Do this.' And not only may we fail to give a reason, but, as often happens in other reasoned processes, we may come to forget that we have had a reason. Then the command appears as self-evidently reasonable. That this process actually takes place cannot be denied. But it is perhaps not the strongest influence at work in producing categorical imperatives. For this we must perhaps look to another principle well recognized in psychology, though not as yet, so far as the writer knows, ever applied to explain the consciousness of unconditional obligation.

The principle in its simplest form appears in hypnotism (q.v.). It is well known that a hypnotic subject feels constrained to follow almost all the commands of his hypnotizer. Ordinarily he unhesitatingly obeys, and does not question the latter's right to issue orders. He may begin to do something else, but feels a restraining force. If he stops short of full performance he will say to himself, as one of Ochorowicz's patients is recorded to have said, 'I have something yet to do' (Ochorowicz, *Mental Suggestion*, English translation, page 63; New York, 1891). This susceptibility to the word of command is not a phenomenon peculiar to hypnosis. We all know how strong is often the impulsion to do what a man with 'strong personality' orders us to do. We say he has 'personal magnetism,' and can make everybody do what he wants. We are also coming to say sometimes that he hypnotizes us.

Now if we reflect that there are certain commands that have been issued to us from our infancy up, by those who in our childhood imposed themselves upon our will; if we remember that every time we were caught disobeying them we were made to feel the inexorable resolution in all our friends to hold us up to the law laid down; if we consider how our counter-tendencies were sternly checked while the 'suggestive' force of the command was allowed free swing, can we wonder that in presence of such a constant, uninterrupted imposition of commands upon us, even the most stubborn of us have come to feel, when we fail to live up to those laws, as the hypnotic subject above alluded to felt—that we 'have something yet to do'? Gradually the very thought of acts contrary to these commands calls up in our consciousness the momentous words, 'Thou shalt not,' and the long habit of acknowledging their authority accords them, when thus revived, not by repetition of outward injunction, but by the psychic law of association, the same recognition of rightful claim over us as they had when enforced by parent and teacher and preacher and exacting neighbor. The outer law of man becomes now the inner law of 'conscience,' and under the influence of current conceptions may be referred to some *daimon*, as by Socrates, or to some ministering angel, or to God's voice in man's soul. All these explanations are but attempts to explain the fact, easily explicable by psychological laws, that "when Duty whispers low 'Thou must,'" Duty is only a reverberating echo of old commands so indefatigably inculcated on us by all the personal agencies that have taken part in our moral education. Reason has no part to play in this process. The most absurd commands may be imposed and be loyally accepted as unconditionally binding, as the history of the moral consciousness shows.

But a time comes in the history of some individuals when the spell of the word of command is broken. They begin to ask, 'Why must I be moral?' They challenge the authority of arbitrary despotism, and demand a reason for the moral law. This is a critical moment, big with possibilities of progress or downfall. In default of wide experience a man may at such a juncture devote himself to what he calls pleasure-seeking. If, however, it can be shown him that the law did not enter that offense might abound, but, in large measure, that invaluable human ends might be realized, the desire he may naturally have for these ends may turn into conditional, teleological imperatives the obligations heretofore blindly accepted but now questioned. Open-eyed submission may take the place of the blind hypnotic control, now spurned; and 'in the confidence of reason' he may come to yield himself a loyal subject to the law as a law of liberty.

When the change takes place it must be expected that the contents of the law will not remain wholly unchanged. Of the many exactions made in the name of morality, it would be strange if some are not found useless or even mischievous. In the nature of the case this discovery can never be the work of any one man or age. The problem is too complex, and the complexity is increased by a constant shifting of values (Nietzsche's *Umwertung*). A teleological morality is that system of conduct that most completely meets human needs and realizes human aspirations. As needs and aspirations vary, so teleological morality must vary. Thus the partial solution of the moral problem of one age means a change in terms of the problem for the next; for every partial solution creates a new situation giving a new outlook, and the exact attitude of new beings to a new situation with a new outlook can never be foretold by human prophecy. This, however, is no reason for despair; for only those who look forward with ecstasy to stagnation could wish to have the problem of morality definitely solved with one flash of insight. But while the problem is never solved definitely, it is progressively solved. Adapting Hegel's words we may say, *Die Sittengeschichte ist das Sittengericht*—The history of morals is the judgment of morals. And the greater the part that intelligence plays in directing the cause of moral development, the more nearly does the historical solution of the problem correspond to the right answer for the time.

We thus see that morality can be described with terms of neither categorical obligation nor hypothetical obligation, but these two forms of obligation represent two stages of morality. Teleological ethics and duty ethics each leaves, therefore, out of account a large part of the moral phenomena. The rival schools ought to join hands in recognizing that each is true to certain facts of the moral life, while neglecting others upon which its rival has concentrated its attention. In this article, however, duty ethics needs no further specific treatment. Teleological ethics cannot yet be dismissed. It is not enough to know that morality tends to become teleological. We must discover what end it comes to recognize as imposing the obligation to be moral. Is there any single object the desire for which is supreme in all human beings who know what they are about?

Hedonism (q. v.) attempts to furnish an answer to the question. It maintains that we ought to be moral, i.e. to do the acts and have the dispositions ordinarily described as moral, because we desire to obtain the greatest amount of pleasure possible or the least possible amount of pain, whether the pleasure and pain be the agent's or some one else's, and because morality is the course which we must pursue in order to obtain this end, which for brevity we shall call the hedonic end. Moral actions are obligatory because the plan of human lives, as involving the pursuit of a maximum of pleasure or a minimum of pain, imposes this obligation as a means to the realization of the hedonic plan. But questions arise now as to the hedonic plan on which morality as an obligation is said to rest. Is this plan an actual plan in all rational human lives? If not, are those who do not adopt it exempt from morality? If they are not exempt, is this because they ought to adopt the hedonic plan? If they ought to adopt it, what imposes *this* obligation? On these points hedonists differ, and it cannot be said that any answers given are satisfactory. Bentham and others maintain, as we have seen, that the hedonic end is the actual end of every human being, and for this reason it *ought* so to be. But Sidgwick, another hedonist, says with point that if an end is an actual end of conduct in every case, there is no propriety in saying that it ought to be; and most modern thinkers would side with Sidgwick. The hedonic plan is not the actual plan of all, or even of most, human lives. Most persons pursue such ends as the acquisition of wealth, of knowledge, of reputation; they do not seek pleasure pure and simple. Nor is it true that they seek wealth, knowledge, and reputation merely because they regard these as means to future pleasure, any more than the normal man eats merely or predominantly for the sake of the pleasure that comes from the stimulation of his palate by food, or from a full stomach. The ordinary man eats his three meals a day, for the most part, either because he is hungry or because he has a three-meal habit; it is true that the expectation of pleasure from his meal often has a part to play in the matter; but careful introspection will perhaps show that it is not often a very influential factor in determining conduct.

Most of the things we do are not done for the sake of the pleasure we expect to get from the doing. If, now, it is the hedonic plan that imposes moral obligation, what about the large number of persons to whom the hedonic end is not a supreme end? Are they exempt from moral obligation? It would be a rash hedonist who should say Yes, in face of the fact that these very persons who do not pursue a hedonic end yet admit moral obligation. Many hedonists, therefore, prefer to say that the pursuit of pleasure is not always, but always ought to be, the supreme end of life. But if it ought to be, what imposes the obligation? The proposition that it ought to be is surely not a self-evident fact; too many intelligent persons who have understood clearly the terms of the proposition have denied it point-blank; and a proposition denied by an expert may indeed be true, but it is not *self*-evident. How, then, prove that every one ought to pursue pleasure? What plan of life is there that can impose such an obligation? To this question several answers have been given. Just one answer need be cited here. Some say that *reason* requires that one should pursue pleasure. Thus Sidgwick in the last analysis makes reason dictate to rational beings the pursuit 'of the greatest amount of happiness as a whole.' This doctrine is thus at the bottom very much like Kant's categorical imperative. The objection to this view is, as we have observed, that many quite rational creatures do not recognize the rationality of the end which Sidgwick thinks prescribed by 'the dictates of reason.' And there has as yet been no method of argument devised to convince these dissenters that they are wrong. Many persons seem to think that the glory of God reasonably overrides every consideration for 'the greatest amount of happiness as a whole,' while at least some persons think that they are reasonable in pursuing their own private happiness as the supreme end. And yet Sidgwick admits that if anything is reasonable it is objectively valid, and those who cannot recognize its validity are wrong, and can be proved to be wrong.

The fact seems to be that no amount of argument will bring about a consensus as to the reasonable chief end or *summum bonum* of all men, because the answer depends upon the nature of the man who gives it. The fact of the dependence of aim on desire is evidenced in the changes that take place year by year, sometimes week by week, in the growing boy. His desires change, and with the change there is a corresponding change in his chief end. Values are thus determined by the relative strength and persistence of the desires. There could only be a common chief end for all men if there were a common chief desire in all men. Historically there has been no such thing, but there has been an approximation to a chief desire common to all the members of some single community, and it is to such phenomena that we must look for the source of moral obligation. However human communities come to be, there is every reason to believe that a common morality came gradually into existence only within an already existent community, even though that community were only a small family. Within such a community, with common associations and common attachments, the welfare of the community can well be the object of common desire, and in small and seemingly primitive communities which we have an opportunity to know from direct observation, the welfare of the community is usually the object of the most persistent of all the intense desires. This can no doubt be in part, i.e. negatively, accounted for by natural selection. Those communities whose members do not subordinate all other objects to the welfare of society cannot hold together. But this is only a part explanation. Other factors make positively for the same result. Mutual affection is one of these factors; imitativeness is another. We all know well how the child gets his enthusiasms from his elders. Seeing what they value above all things, he comes to set the same supreme value upon this same thing. And this tendency is fostered by the elders in their training of the young. The family, the clan, the tribe is glorified in song and story, and no pains are spared to engender in the young the spirit of loyalty. In this way every normal child within the community comes to have a supreme desire shared with all his fellows. The accomplishment of this desire involves obligations. Experience teaches what actions are necessary to render the accomplishment possible. These actions become obligatory with the acceptance of the end, and because the end is not questioned the obligations it imposes come to be regarded as absolutely unconditioned.

But experience is not the only agency at work in suggesting proper means for the accomplishment of the common supreme end. Superstition plays its part. Many means are supposed to be necessary, which are really not necessary. How this comes to be is intelligible only in the concrete case. Dreams, hallucinations, accidents of all sorts, are regarded as having value in suggesting proper means to strengthen the community. Thus it was seen that cowardice was fatal to tribal welfare; but it was also thought that "meet adoration to the houshold gods" was as necessary as bravery. Whatever in any way came to be regarded as a necessary means to secure the public welfare came to be unconditionally demanded; and thus, as we have seen, arose the categorical imperative. But its rationally binding character on the individual depended entirely upon his acceptance of the general scale of values current in his community. In primitive times this acceptance must have been all but inevitable. Liberty of private opinion is a modern luxury, and when private opinion is not tolerated the individual either accepts the general estimate or is killed or banished.

It should be noticed that in the above explanation of the ethical solidarity of a primitive community, it is not implied that tribal morals are forced upon every member of the tribe against his will. In the large number of cases the obligations imposed are cheerfully accepted. There is no thought of revolt. The individual may even feel that his observance of the tribal regulations is of his own undetermined will. But freedom of choice is not incompatible with an explanation of the causes of choice. The question is not what views the individual has of the origin of his ethical unanimity with his fellows. His views on the subject, as well as his views about the origin of his tribe from some totem animal, may be absolutely false. The question is, what view a careful scientific investigation of the facts, sociological, anthropological, and psychological, renders probable or satisfactory as a working hypothesis; and all that is claimed for the above explanation is that it seems to do justice to all the facts, and is the only explanation as yet given that does this justice.

The explanation thus given of the moral unanimity within a tribe explains also such limited measure of moral unanimity as we actually find between tribes. When actual experience of social injury resulting from some course of action is the chief cause of the social condemnation of such act, it may very well be that communities widely separated have the same experience. Such consensus of moral judgment as is found actually to exist among different communities is thus largely to be accounted for by similar experiences under similar circumstances. Such consentient judgments as are not thus accounted for may perhaps be explained by common tradition from some common source, or, in some cases, by accidental coincidences. Such differences as are found to exist may be accounted for by differences of circumstances, of superstition, intelligence, or by other considerations. Thus scarcity of food in communities where men are the food-getters may make polyandry socially advantageous, while in other communities, where different conditions prevail, polygyny may not be recognized as prejudicial to the interests of the community. Differences in moral views due to differences in superstition and in intelligence are too numerous and too well recognized to need more than passing remark.

With the growth of freedom of the individual to think for himself, there inevitably comes about a change in the moral conditions. Individual freedom is often gained at the expense of the integrity of the tribe, or of the State into which the tribe has grown or merged. At such times, with the removal of the cause that makes for unanimity of ethical judgment, morality takes on a personal rather than a social character. The morally right is no longer so much what is socially advantageous as what is to the advantage of the individual agent. This desocialization of morality is a marked feature of the later ethics of the Greek decadence, and to a large extent of the ethics of the revolutionary eighteenth century. And this change of the moral centre of gravity from the community to the individual continues until a new social integration takes place. During such a period of transition from one form of social morality to another, many superstitions disappear; perhaps some new ones take their place. Some are modified instead of totally disappearing. This change in superstition profoundly modifies the character of morality, which tends to dissociate itself from superstition and to depend more largely upon intelligence, but not necessarily upon the intelligence of the individual moral agent. His insight, if it is superior to that of his fellows, tends somewhat to modify current moral views; but normally this change is slow. Not only insight, but emotion, plays the part of cause in such change. A man of strong affections may succeed in arousing the feelings and modifying the desires of his fellows, and this affectional change may ultimately result in marked alteration of social morality. Of course it must not be thought that the action of intelligence and of emotion can ever be completely separated. All that can be said is that either intelligence or emotion may vary largely without equal variation in the other, and this non-coincidence of variation makes it possible to distinguish with some precision changes in morality that are more largely due to change in knowledge from changes in morality that are largely due to change in feeling. Thus the ethics of modern warfare differs from that of earlier times more, perhaps, by reason of a growing cosmopolitan sympathy than by reason of insight into the uselessness, even the harmfulness, of wanton outrage committed against an enemy. But in this case growth of insight has also undoubtedly played a part. On the other hand, such change as has taken place, at least in America, in the moral attitude toward the marriage of a widower with his deceased wife's sister, is due rather to growing knowledge of the harmlessness of such a union than to any increase of sympathy or to other emotions, although even here emotion may have something to do with the change.

We are now perhaps in a position to define morality. The definition is long and cumbersome;

but this is due to the fact that the thing defined is, as we have seen, very complex in character. The definition will run somewhat as follows: Moral conduct is the voluntary action of a self-conscious person, in so far as that action is amenable to a standard of obligation imposed on him by social influences or by a supreme plan of life that draws its materials from society. In moral conduct the plan of life is always first adopted by the agent from the community in which he is reared, whether family, clan, tribe, or religious organization; but it may afterwards be more or less modified by his intelligence, emotions, and personal experience. Let it be remarked, by the way, that apart from the use of the word moral as an epithet applicable to all phenomena thus defined, it is also frequently used to denote those actions that conform to the obligation mentioned in the definition. In the former sense the antonym of 'moral' is 'non-moral'; in the latter it is 'immoral.'

We are now able to understand how the conduct of moral idiots, i.e. beings without any community of obligation with other men, stands related to morality. These persons seem never to have adopted from their social environment a supreme plan of life. This failure is largely due to defect of instincts. They never seem to care for the valuation set by society upon different human ends. They seem to choose from the outset selfish ends. They seem, in a word, to be non-moral rather than moral. And this exemption from morality is not due to lack of intelligence, but to abnormality in emotional endowment; and in many cases there seems to be no remedy at hand. But there are other persons to whom the above description does not apply, and yet who, on superficial examination, appear to be moral imbeciles. These persons have adopted a supreme plan of life from their social environment. But the environment may be exceptional; that is, it may widely diverge from the general character of other social environments of the same time and in the same region. These moral agents are insensible to the ordinary moral ideas of the time, because these ideas are incompatible with ideas they have long held. Perhaps the insensibility has become chronic; perhaps it is still remediable. Only experiment can determine. These persons are not moral idiots, that is, not non-moral. They are moral unfortunates; they may not even be seriously immoral in the sense of coming far short of meeting such moral obligations as they have come to recognize. Still other persons have begun life with the normal ideals, but for one reason or another they have not lived up to these ideals, and have gone so far as to give up the ideals entirely. All these differences must be taken into consideration when one is asking whether a particular departure from ordinarily recognized morality means immorality or non-morality. It is immorality only when the moral obligation, practically ignored, is still recognized as binding.

But this leads to other questions. Of two different moral standards, can one be said to be more moral than the other? Is there a standard for testing the relative excellence of actual moral standards? Is the morality that is subject to evaluation by comparison with a morality which ought to be? If so, what is this standard? How is it ascertained? What imposes it as a standard upon actual morality? These questions have often been thought to be absolutely unanswerable by any science of ethics, for it has been said that science describes but does not prescribe; that a science of ethics, in the sense of a systematic presentation of actual moral judgments, can indeed be constructed, but not a science which shall criticise actual morality and suggest improvements. Such a statement as to the limitations of science is inadequate. It is perfectly true that no science directly prescribes. The science of geometry does not prescribe surveying, nor does the science of electricity prescribe electric lighting. What a science can do is to describe the conditions which must be met before a given aim can be attained; and among several means to the attainment of an end, it can point out that which involves the least effort or that which is the best under given circumstances. Every so-called practical science is a more or less systematic knowledge of the conditions which must be met before a certain result can be obtained; but it cannot be accurately said to prescribe the result. The result is prescribed by some need and the means to its attainment described by the science. Now ethics is a practical science. It makes no absolute prescriptions. All it does is to study the facts of the moral life, and as a result it may be more or less able to describe the conditions that must be fulfilled before what it discovers to be the end of the moral life can be realized. This study does reveal many imperfections in actual morality, but these imperfections which we now have to mend are imperfections of means and not of ultimate end. This discussion will enable us to answer the questions placed at the beginning of the paragraph. Of two moral standards, in the sense of moral rules prescribed for the attainment of a certain moral end, one may be more moral than another, in the sense of being better adapted to attain the moral end. The standard by which two such differing moral standards may be tested is that of conduciveness to the moral end. The existing morality, in so far as it consists of such rules, may easily be defective, and a more adequate knowledge of all the pertinent facts may result in the discovery of a morality that ought to replace the actual morality. This discovery is the business of science; the acceptance of the obligation to forsake actually observed rules and to adopt the newly discovered rules of action is the work of the moral agent as a person with a supreme plan reasonably pursued. Thus it appears that while ethics is concerned with the morality that is, it may also discover conditions formerly unknown; and this discovery may react on the morality that is, making it more like what it ought to be; i.e. it may make moral action more commensurate with the moral end.

Scientific ethics might conceivably do even more. In case it were discovered that actual morality had no single ultimate end consciously arrived at, but different ends set up in different communities and at different times, it might also discover how it came about that there was thus a multiplicity of ends; and it might even discover that there was a way of harmonizing these various ends. It might be able to describe an end which, if realized, would include the realization of all, or of the larger number, of these historical ends. But here again a science could not as a science prescribe this inclusive end. Unless the end, as inclusive, appealed to men, ethics could not force it on them. It would occupy a position similar to the science of telegraphy. When it was discovered that it was possible to send a message over long distances with great rapidity, this bit of scientific knowledge did not prescribe to men the adoption of the means of transmission. It was only human needs that imposed the obligation to adopt telegraphy. This inability of science to impose new ends constitutes part of the tragedy of scientific inventions. Many a man has devoted his life to making possible the attainment of a new end, only to find when his labors were done that the end was not desired by mankind at large.

In a sense it can perhaps be said that ethics has discovered a multiplicity of ends among men. As we have seen, sometimes it is social welfare, sometimes it is individual welfare that men make their supreme end. Again, both social and individual welfare are very differently conceived in different times and places. Sometimes social welfare is thought to consist in military strength; sometimes in economic conditions; sometimes in artistic productiveness, and so forth. So also individual welfare is sometimes thought to consist in the possession of abundance of means of sensual enjoyment, or in physical prowess, or in intellectual power, or in social prestige, or in religious zeal, or what not. With regard to all these various ends, ethics can discover or attempt to discover, with the help of other sciences, whether when attained they have given permanent satisfaction; whether rather the attainment of many of these ends has not as a rule involved moral agents in misery which could have been avoided had the ends not been sought; whether such disappointment was due to accidental circumstances, or whether, human nature and human environment being what they are, such disappointment was inevitable; whether, if the latter alternative be true, any other end could have been pursued with reasonable chances of better success. But suppose all these questions answered and an end discovered which promises, when attained, to give satisfaction. Even then it would be only the desire of men for such an end that could impose upon them the obligation to adopt the course of action necessary to attain it. Again, suppose such an end were a social end, and could not be realized within the lifetime of any now living, but could be attained in, say, five hundred years. Whether the pursuit of that end would be undertaken or not would depend upon the relative strength of the desire for that future consummation and the desire for other objects that would necessarily be sacrificed in order to work for that consummation.

There is, however, another question that must be answered here: Is there no difference between what is actually desired and what is really desirable? Take the last case supposed. Granting that mankind at large did, when such an end was presented to it, reject it as too remote and too quixotically altruistic, and did set about to realize some other end, could it not be said that in spite of the fact that the end is not desired, it is desirable? Or shall we have to say, with J. S. Mill, that "the sole evidence it is possible to produce that anything is desirable is that people actually desire it"? In answer it must be said that desired and desirable are different conceptions; that people often actually do desire what is undesirable; so that Mill's statement cannot be accepted as it stands. But there is a profound truth which the statement perhaps attempts, but fails to express. The statement must be amended. Nothing is desirable that is not desired, *or would not be desired if adequately known.* Thus I may desire a certain fruit I see for the first time. Its color is tempting, its whole appearance makes a strong appeal to me to pluck it and eat it. But in spite of this the fruit may not be desirable. It may be deadly, or it may be extremely sour or astringent; or it may have a nauseating smell, which as yet I have not perceived. It would be desirable if I knew all about it and still desired it. It is a common experience that things eagerly desired are found afterwards to be undesirable, and are then judged to have been undesirable all the time we were longing and striving for them. Thus the measure of desirability is not the strength of the actual desire which persons have, but the desire they *would* have if they only knew the real bearing of these desires upon their happiness.

Among the things that should be adequately known are the character and tendency of our future desires. Just now, being blind, I may have no desire for fine paintings in my room. But if I knew that within a few years my blindness would be cured, and that then I should crave beautiful objects of sight, the knowledge would tend to make me now desire to have the pictures. Now apply this answer to the supposed case that called forth the question. The welfare of society five hundred years hence would have no value to men who were not genuinely unselfish; that is, who desired only their own pleasures. But men do actually desire other things than pleasure, even when they know that these things cannot possibly bring them pleasure in the future. Many a disbeliever in immortality has earnestly desired and worked for some end which he knew could not be accomplished until long after his death. It is true that he would not have so worked for it if he had not taken pleasure at the time in the end; but he did not work for the sake of a future pleasure to come from a future realization of his plan. If the welfare of humanity five hundred years hence, when the idea of that welfare is clearly presented to men with all its bearings upon all their desires, did not arouse a desire to realize it, that welfare would not be desirable for these men. This difference thus described between the desired and the desirable also holds good between the preferred and the preferable. The preferable for any man is what he would prefer if he actually had all the information that was necessary for an intelligent preference. So also, finally, the supreme end, or *summum bonum,* for any man is that end which is preferable to any other. The nature of all his desires in their true interrelation and in their relation to the actual world in which he lives, determines the *summum bonum*, but he may not know what that *summum bonum* is, because he may not understand thoroughly either the world in its relations to the system of his desires, or the interrelation of his desires. In the sense that a science of ethics may, conceivably at least, throw light upon these questions, it may discover the *summum bonum;* but it cannot impose upon any man a *summum bonum* which is irrespective of his actual nature as a being with quite definite desires.

If the question is now asked whether ethicists have as yet come to any agreement as to the nature of the *summum bonum*, the answer must be No. However, the following description of the *summum bonum* is given, because it seems to do justice to all the determining factors of the problem. The *summum bonum* of any moral man is not any one single object, whether attainable at a stroke or altogether unattainable, which if attained would continue to satisfy him. It is rather a progression of objects. The *summum bonum* is a serial system of ends which are, each in its turn, the most desirable ends capable of pursuit. An element in its desirability is that it shall fix favorable conditions for further pursuit of further similar ends, as well as give pleasure in the ends already attained. Again, because the normal man is a social man and thus interested in seeing the good of at least some of his fellows, there is found among the ends included in the *summum bonum* the welfare of these fellow-men. By welfare is meant the progressive realization of the progressive *summum bonum* of each of these fellow-men. Now the fact that the *summum bonum* of each normal man includes within itself the welfare of some other men constitutes a community of welfare. The question how many persons shall be included in the community of welfare is determined partly by objective conditions and partly by the actual reach of the benevolent emotions: by objective conditions, because no matter what may be my affectional attitude toward another man, it may be the case that unless he has his welfare he will be an impediment to my obtaining my welfare; by the actual reach of the benevolent emotions, as is proved by history, which shows that as men have become larger-hearted, the community of interests is shared in by a larger number of individuals. It must be borne in mind that the *summum bonum* thus described is not imposed upon any individual by any obligation. Unless an individual is so constituted that he finds such an end the most desirable of all ends, it is not his *summum bonum*. All that has been attempted is to describe in very general terms an end that it is believed will be found to be most desirable by normal human beings. Abnormal human beings, who have no liking for their kind, or who are rabidly monomaniacal, or who in some other essential features vary from the kindly race of men, are not taken into account. Their *summa bona* are radically different, and because this is so there is apparently no possibility of welfare for them consistent with welfare for normal men. They are not included directly in the community of human interests. All that can be demanded for them is so much of welfare as is consistent with the welfare of mankind in general.

But though ethics as a science cannot impose an end on man, man individually and collectively can impose ends upon man to a certain extent. It is a fact, as we have already seen, that what a person shall desire is to a large extent determined by what other persons desire. A community or an individual with a definite conception of a supreme end can do much to influence a child or even an adult to desire that same end; and this makes moral training possible. Moral training and the teaching of ethical science are two quite distinct operations, although they may, and often do, go hand in hand. Moral training consists in an attempt to habituate a person to actions and dispositions such as are desired by the trainer. It is the process of inducting a person into a communion of ends with another person or with a group of persons. Ethical teaching is the process of bringing a person to see and understand the facts of the moral life. The former is an attempt to develop appreciations, the latter to develop insight. An appreciation without insight is blind; insight without appreciation is ineffective.

Moral training, however, is a fact in the moral life, and as such has a place in ethics as a science of the moral life. Ethics studies the facts of moral training and discovers what its purpose is, and what the realization of that purpose does in the way of meeting human needs. It may ascertain e.g. the fact that the actual end pursued in any particular species of punishment is of an evil nature; that is, that men being what they are, society is injured rather than benefited by a realization of the end. It may discover that other ends if realized would avert these evil consequences and produce advantageous results, and it may discover the best means to the securing of these ends. All this is a matter of descriptive science, not in the least directly prescriptive. The beneficial ends and the expeditious means to the ends are prescribed to men by their desire for the advantages described. A study of moral training shows that it is a very complex affair, and into its complexities we cannot here enter. Example and precept, admonition and chastisement, reward and 'pious fraud,' threats, actual infliction of pain, appeals to nascent desires and aversions, are all employed more or less frequently. All these instruments of moral training have their characteristic effect, and these must be experimentally ascertained. And again, not only moral training, but vengeance, is a phenomenon of the moral life. It aims at the infliction of pain on an offender to appease by his suffering the suffering of his victim or of the sympathizers of his victim. It has its characteristic results. These are studied by ethics. The results of this study may, as a fact do, secure general condemnation of such vengeful punishment; but this, again, is because the outcome of a vengeful policy is undesirable.

Another question must now be taken up. Is it not possible that ethical insight may tend to discountenance morality? When it is seen that morality is reasonably obligatory only because imposed by a supreme plan of life, and that the supremacy of this plan is given to it by the voluntary adoption of it on the part of the individual, may he not decide voluntarily to adopt some other plan? This would be possible if one's choices were not determined by one's character, and one's character by one's desires, instinct, habits, and expression in general. If scientific knowledge of conduct could radically change a person's character, then scientific ethics might profoundly change morality. But while some change is possible and actual under the influence of new ideals gained by new knowledge, this change has its limits, and within these limits it is desirable. Morality is not a thing of yesterday and to-day, but will continue so long as man is a rational being with wants and desires, among which his social needs are of paramount urgency.

The possibility of the evolution of morality out of non-moral conditions was some years ago seriously contested on metaphysical and theological grounds. The theological grounds do not concern us. The metaphysical grounds of objection are invalid. The strongest argument of the opponents of evolutionistic ethics is based on the necessity of self-consciousness for morality, and on the alleged impossibility of the evolution of self-consciousness. The fallacy of this argument has been often pointed out. The 'timelessness' of self-consciousness does not consist in the fact that the self has not a place in time as an event, but in the fact that the objects of that self's knowledge are not confined to the peripherally aroused sensations of the present moment. The assertion that a consciousness in time cannot know time is an unfounded dogmatic dictum, and yet only on the supposition that this statement is true can it be maintained that consciousness and self-consciousness are in their nature incapable of explanation by evolution. The exact course taken in the evolution of morality from the non-moral is still an open question; but the truth of the statement that morality is an evolved product stands or falls with the general truth of the evolution of man from the non-moral animals.

The only other question that can be discussed here is that of free will in its bearing on morality. Can there be moral responsibility if the will is determined, that is, if the volitions of man are events which find their complete causal explanations in previous events? In the light of what has been said it must be maintained that unless the human volitions were determined, responsibility would be impossible. Ethical responsibility is the liability of a person to answer for his conduct before the bar of reason. A commits an act and is held responsible. This means that A is amenable to the demand to prove that his act is in accord with the supreme plan of life, or that his supreme plan is the right plan. Given a supreme plan, intelligent experience can determine the relation of an act to the realization of that plan. A reasonable person who adopts that plan may be constantly called upon to justify the means he takes to realize that end. Condemnation of an act in such a case means that it is recognized as not conducive to that end, and that it is disliked as having that tendency. Approval means that it is recognized as conducive to that end and is liked as having that tendency. Or again, instead of raising a question of means to an end, there may be a question about the end. We have seen that though the actual supreme end pursued is not imposed by reason, yet knowledge of the bearing of the attained end upon actual desires may lead to change of ends. Moral responsibility may mean the liability of a person to justify his supreme end—that is, to show that it is *desirable* as well as desired. Approval or condemnation of the end is a recognition of its desirableness or undesirableness, and the resulting affectional tone. It of course carries with it approval or disapproval of the means leading up to it. In ordinary life the supreme end is unreflectively pursued, and the means to it taken for granted as presented in some moral code. The only function of conscience in such cases is the approval or disapproval of an act as conforming to the moral code. In any case the whole activity of conscience is useless unless the judgments and feelings involved determine future conduct. Not only so, but also the past conduct judged, if conceived as wholly or in part the pure chance product of some blind arbitrary agent called 'will,' is not a means to any end, and therefore neither approvable nor condemnable as such. Now, free will, either in the sense of a liberty of indifference or a liberty of alternative choice, in so far as it is undetermined, is pure chance, as is conceded by Professor James, one of the most prominent supporters of indeterminism. Responsibility does not, therefore, presuppose indeterminism of the will, but it does presuppose that the will can be determined either by the knowledge of the conduciveness of a means to an end, or by the knowledge of the adaptedness of an end to satisfy a desire. A person who can by rational means be brought to see the inadequacy of his acts to the supreme moral end, or the inadequacy of his supreme moral end to his whole nature as a being with definite needs, is responsible; that is, in case his acts or his ends are undesirable, he can be convinced of their undesirability and be led to condemn them. In other words, he has a conscience.

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ETHIOPIA (Gk. Αἰθιοπία, *Aithiopia*). The name given by the Greeks to a country south of Egypt variously conceived as including only Nubia (*Æthiopia Ægypti*), or Nubia, Sennar, Kordofan, and Abyssinia, or a region extending indefinitely east and west from the Upper Nile, but applied after the fall of Meroë more particularly to Abyssinia. The vagueness of the term is largely due to the significance attached to it by the Greeks, who seem to have derived it from αἴθειν, to burn, and ὤψ, face, and explained it as the country of sunburnt faces. Some scholars regard Αἰθίοπες, as an original Greek designation of the negroes. Others prefer to look upon it as an attempt by Greek folk-etymology to extract a suitable sense from an unintelligible native name. It has been plausibly suggested that this name may have been *Atyubyan*, 'incense-gatherers,' from *tayib*, pl. *atyub*, 'aromatics,' and that this was the equivalent of *Habashat*, the Egyptian *Hbst*, the modern *Habesh*, or Abyssinia. In common use the name is given to the West African peoples of Nubia and Abyssinia (Ithiopiavian). Deniker (*Races of Man*, London, 1900) applies it to the third of his twenty-nine human races, including Bejas and Gallas modified by Arab blood among the Somalis, Abyssinians, etc., and by negro blood among the Zandeh and Fulbé. Keane (*Ethnology*, Cambridge, 1896), while relegating the Ethiopians to their proper place in the Hamitic section of the Caucasic division of man, names the generalized negro *Homo Æthiopicus.* At least since the middle of the second millennium B.C. Eretria and the Somali coast were not unknown to the Egyptians. Through the expeditions of Queen Hatshepsut (Hatasu) (B.C. 1512-1481) down the Red Sea to Punt, the lands on both sides of Bab el Mandeb became more familiar than the territory on the Upper Nile. Yemen was looked upon as the land of the gods; while the products brought from Punt-Hbst caused many a marvelous tale to be told of that country. That the people of Punt were not negroes, but belonged to the Mediterranean race, is quite evident from the pictorial representations. From accounts of them, the Greeks may have derived their earliest notions of the men who lived in the farthest south. In the Homeric poems (*Odyssey*, i. 23 sq.; *Iliad*, i. 423; xxiii. 206) the Ethiopians are represented as dwelling at the utmost limits of the earth and enjoying personal intercourse with the gods. This ideal picture is regarded by some scholars, not as an echo of the popular Egyptian conception of Punt or 'the divine land,' but as a reflection of the admiration felt in priestly circles in Egypt for the theocratic régime introduced by the Ammon priesthood in Napata during the Twenty-second Dynasty (B.C. 960-774). In Hesiod the term seems to be used vaguely of a territory south of Egypt and Libya. Herodotus (iii. 114) describes the Ethiopians as μακρόβιοι, long-lived, and regards their country as extending to the Southern Sea. This apparently implies that he includes Abyssinia, Eretria, and Somaliland. Later Greek writers use the term sometimes as a designation of Nubia, sometimes in a much wider sense. Historically there are three distinct kingdoms known as Ethiopia, those of Napata, Meroë, and Aksum. There is no definite evidence that either of these included at any time all the territory between the southern border of Egypt and Bab el Mandeb. Only the Kingdom of Aksum seems to have claimed the name Ethiopia; in the case of the others it was apparently a Greek and Roman designation solely.

Kingdom of Napata. For a description of that part of the Nile Valley which was ruled from Napata, see Nubia, and for a description of the city itself, see Barkal. Already in the time of the Old Empire the Egyptians had relations with their southern neighbors. From the forests of Nubia (*Knst*) they obtained a large proportion of their timber, and the city of Abu (Elephantine) derived its name from the ivory which found its way to this place from the interior of Africa. King Unas (c. 3290-3260 B.C.) employed warriors belonging to six Nubian tribes in his war upon the Bedouins. The early pictorial representations of Nubian archers do not suggest that they were negroes. A regular conquest of the country south of Syene (see Assuan), apparently was not undertaken until the Twelfth Dynasty (c. 2522-2323). The most powerful Nubian people at this time was Kash or Kosh, the Hebrew Cush (q.v.). The ethnic relations of this people cannot be determined with certainty. But it is probable that the stock was originally Hamitic, though in course of time it absorbed various Negritic tribes. Usertesen III. (c. 2409-2372) established his frontier north of the second cataract, and built for its protection two forts at Semneh and Kummeh on opposite sides of the river. Whether the Hyksos kings ever held possession of this territory is doubtful. At any rate, it had to be reorganized by Aahmes (1575-1553), the founder of the Eighteenth Dynasty, and his successors. Napata probably had been the capital of the independent kingdom, since it was made the residence of the viceroy, entitled 'Prince of Kosh,' who governed the new Egyptian province. In the time of Rameses II. (1347-1281) there may have been an unsuccessful rebellion. The high priest of Ammon Ra in Thebes, Herihor, in the beginning of the eleventh century, proclaimed himself 'King of Upper and Lower Egypt.' This his successors in the pontificate were not able to do, but seem to have recognized the Tanitic Dynasty. But a branch of the family established itself at Napata, probably at the end of that dynasty (c.1000). In the Twenty-second Dynasty (960-774) these kings threatened the border of Egypt. One of them, Pianchi I., who seems to have reigned in Napata since 777, availed himself of the weakness of Egypt at the end of the reign of Uasarken III. (c.762-756) to make an invasion of Egypt. He defeated twenty petty rulers and made a treaty with Tefnacht of Sais in B.C. 756. After his death (746), Kashta (c.746-734) and Pianchi II. (c.734-715) were apparently not capable of maintaining any control of Egypt. But the grandson of Pianchi I., Shabaka (715-703) united all Egypt with Ethiopia under one crown. This king cannot be identical with So, the ally of Hosea of Israel, as has been supposed, Siwa or Sibu being in all probability a king of the North Arabian Muzri. His successor, Shabataka (703-

691), was dethroned by Taharka (691-664). In his time, Esarhaddon, of Assyria, invaded Egypt in 673 and again in 670, when Memphis was taken. On a stele found at Zenjerli in northern Syria, Esarhaddon's triumph over Taharka is represented. Taharka was driven back into Ethiopia. Tanuat Amen (664-663) tried in vain to reconquer Egypt, where, on the decline of the Assyrian power, Psammetich I. (663-610) made himself ruler. During the reign of this Egyptian king, Herodotus states that a large number of dissatisfied soldiers emigrated into Ethiopia. The place where they settled cannot be determined with certainty, though it has been suggested that the island of Meroë may have received many of them, and their number (240,000) has, no doubt, been exaggerated by Herodotus (ii. 30). An invasion of Ethiopia was probably made by Psammetich II. (594-588), referred to in the Greek inscriptions of Abu Simbel. Napata was destroyed by Cambyses in 524. There is no positive evidence that this kingdom ever extended beyond Noga, immediately south of Khartum, where Egyptian inscriptions have been found. A number of hieroglyphic inscriptions still remain undeciphered. They are probably written in the native language of Kosh.

Kingdom of Meroë. On the capital of the new kingdom that gradually arose in the south after the fall of Napata, see Meroë, and for a description of territories that at one time or another formed a part of it, see Sennar and Kordofan. The Achæmenian monarchs received tribute from kings who seem to have made Meroë their capital. Whether these kings were of the old line is uncertain. While the theocratic constitution described by Greek writers no doubt had developed already in Napata, the subordination of the king to the priesthood seems to point to a new régime, in which the king was a mere tool in the hands of the clergy. The kings, Arura, Harsiot, Nastasen, who reigned in the fifth and fourth centuries, conquered considerable territory south of Meroë in Sennar and Kordofan, and possibly in Abyssinia. While the suzerainty of the Ptolemies seems to have been recognized for religious reasons, King Ergamenes, by putting to death the priests who had demanded that he should abdicate in the time of Ptolemy IV. Philopator (221-204), paved the way for independence. Ptolemy V. Epiphanes (204-181) was able to resist his attack upon Egypt, but not to prevent his assertion of sovereignty in Ethiopia. Queen Candace seems to have extended her power in the north, and twenty-five provinces are said to have been tributary to her. But her invasion of Egypt was successfully resisted by Caius Petronius in B.C 24. Napata, that had been rebuilt, was destroyed by the Romans. Another Queen Candace is mentioned in Acts viii. But gradually Meroë itself fell into ruins. To guard against invasion by the Blemmyans, a people akin to the Bugaitæ, the modern Beja, Diocletian moved the Nobatæ, negro tribes of the same stock as the population of Kordofan, from the oasis of Khargeh into the Nile valley. See Nubia.

Kingdom of Aksum. The mountain region of Abyssinia was probably inhabited in very early times by Semites as well as by Hamites. Whether the original home of the former was in Africa or in Arabia (see Semites), the overflow of population would naturally set in the direction of this Alpine country. As the native name shows, the Semitic Ethiopians were still in the nomadic state when they entered this territory, priding themselves on being 'wanderers' roaming freely wherever they liked. (See Geez.) There were evidently successive waves of immigration. If the Egyptian Hbst is of Semitic origin, as can scarcely be doubted, there were apparently kinsmen of the Yemenites in Eretria and on the Somali coast c. 1500 B.C. Sabæan inscriptions found in Yeha, the ancient Awa, may be as old as the seventh century B.C. Names of places such as Alwa, Daro, Sant, Harar, Hasak, and Awa are manifestly of South Arabian origin and seem to indicate a trade route between Yemen and Meroë lined with Semitic settlements long before the Christian Era. As long as the Ptolemies dominated the Erythrean coast from Adulis, Berenice, and Arsinöe, a strong Abyssinian kingdom could not well develop. But in the reign of Augustus, when the Romans suffered serious reverses in Arabia and were occupied in Africa with Queen Candace, while the Arsacid conquests in eastern Arabia forced the Yemenite States to seek compensation for their losses elsewhere, the Semitic element in Ethiopia seems to have been reinforced, and the Kingdom of Aksum founded. The *Periplus maris Erythræi*, probably written by Basiles between A.D. 56 and 67, refers to a King of Aksum by the name of Zoscales, who controlled the coast from Massowah to Bab el Mandeb, and was a friend of Greek culture. It is possible that some of the gold coins with Greek legends that have been preserved should be assigned to the second and third centuries A.D. Ten kings are known through these coins, viz. Aphilas, Bachasa, Gersem, Uzas, Nezana or Aizana, Ulzeba, Azael, Uchsas, and Esbaal or Aieb. Those that have the mark of the cross are clearly from the fourth and following centuries; but those without such a mark are probably earlier. On a marble throne in Adulis, Cosmas Indicopleustes found and copied in the sixth century an inscription commemorating the power of a great king whose name is not given. He has been supposed by some scholars to be the founder of the Aksumite kingdom, but it is more probable that he reigned at the end of the third century A.D. He possessed a part of southwest Arabia and fought with the Kasa (Cush) and the Buga (Beja). The Γάζα ἔθνη that he mentions as his subjects are probably the Agazi or Geez tribes. King Aizana is known to have reigned in the year A.D. 356. In his time Frumentius (q.v.) preached Christianity in the country. The political relations that had long existed between Aksum and Rome were such as to favor his mission. El Amida, his successor, who reigned before 378, still held control of parts of Yemen. The two Rüppell inscriptions written in the peculiar vocalized writing of the Geez (see Ethiopic Writing) probably belong to his reign. In 378 Aksum was reduced to its African territory. The names of some kings of the next century may be represented on the coins. Only a few can be deciphered with any degree of certainty on the copper coins; viz. Mehigsen, King of Aksum, Hatasn, King of Aksum; King Elaats, and King Zwazan. In A.D. 525 Elesbaas, King of Aksum, with the aid of the Sabæan and Hadramautian rulers, made an end to the Himyarite kingdom of Dhu

Nuwas, and Ethiopia again controlled Arabian territory. Before the end of the century, however, the Aksumites were driven back to Africa, and never again extended their conquests to Arabia. According to a letter addressed by a king of Aksum to a king of Nubia in the time of the Patriarch Philotheus of Alexandria (980-1002), preserved in a fourteenth-century *Life of the Patriarchs* and in the Ethiopic *Synaxar*, a woman who reigned over the Beni el Hamuna had recently invaded the country, burned churches and monasteries, and driven him from place to place. Marianus Victor (1552) speaks of this woman as the founder of the Zague Dynasty, and as having married a ruler of the Province of Bugna. Later legends made of her a Jewess. She was probably a queen of the reigning family who married a prince of the Beni el Baguna, a name afterwards corrupted into Beni el Zague. Eleven kings of the so-called Zague Dynasty reigned until 1270. The most famous of these is Lalibula (c.1200 A.D.). In 1270 Yekuno Amlak restored the old line. Yekuno Amlak removed his residence to Tegalet in Shoa, but Aksum still remained the city where the kings were crowned. His successor was Wedem Raad (1291-1314). Amda Sion (1314-1344) was a powerful king who fought bravely with his Muslim neighbors. Saifa Arad (1344-1372) carried on a successful war in Upper Egypt against the Sultan on behalf of the Patriarch of Alexandria. His successors were Wedem Asfare (1372-82), and his brother, Dawit I. (1382-1411), Teodoros I. (1411-15), Yishak (1415-30), Andrias (1430), Takla Maryam (1430-34). Zara Yakob (1434-68) was a brave warrior and an able administrator. He was followed by Baeda Maryam (1468-78), and Eskander, or Alexander (1478-95), in whose time Cavilham visited the country. Amda Sion II. (1495) and Naod (1495-1508) were of less importance. But Dawit II., called Lebna Dengel, in his battles with Adal showed himself to be a good soldier. Asnaf Sagad (1540-59) conquered Ahmed Granje, King of Adal, but in his reign the Gallas invaded the country. After the reign of Minas (1559-63), Sarsa Dengel came upon the throne (1563-97). This monarch destroyed Adal and fought successfully with the Gallas. In the time of his successors, Yakob (1597-1603, 1604-07), Za Dengel (1603-04), Susneus (1607-32), and Fasiladas (1632-67), religious difficulties occupied much attention. The power of the following kings was greatly limited by the Galla chiefs that ruled in many districts. They were: Johannes (1667-82), Jasus I. (1682-1706), Takla Haimanot I. (1706-08), Theophilos (1708-11), Justus (1711-16), Dawit III. (1716-21), Bakafa (1721-30), Jasus II. (1730-55), Joas (1755-69), Johannes II. (1769), Takla Haimanot II. (1769-77). On the more recent history, see ABYSSINIA.

ETHIOPIC LANGUAGE. The earliest monuments of Semitic speech in Ethiopia are the inscriptions found at Yeha. These are written in the consonantal Sabæan script. But while the presence of the article *an* appended to the noun and a final *m* to show indetermination is a sign of close affinity to the Sabæan, both syntax and vocabulary indicate that the writers used the *lesana Geez*, the language of Semitic Ethiopia, possibly as early as the seventh century B.C. The bilingual inscription (Greek and Ethiopic) exhibits essentially the same speech. So far as the language is concerned, there is not much difference between it and the Rüppell inscriptions, which are written in the syllabic script characteristic of Ethiopic manuscripts. These Aksum monuments present the same type of language as the literary documents. Geez probably continued to be spoken by the common people until the Zague Dynasty came into power. From that time the Amharic probably began to gain upon the classical tongue. Yekuno Amlak, in 1270, made the former the official language, and Geez henceforth became the language of books and of the Church, and as such had a second flourishing period. In its general structure and vocabulary Geez is closer to the Sabæan than to classical Arabic, but in some respects it has features that are younger than the latter. Thus the case-endings have disappeared; the old passive is lost; aspirated dentals are changed into sibilants. Geez appears to have dropped the article some time before our era. As a substitute anticipating suffixes are used as in Aramaic, and also demonstrative pronouns. Of a dual there are only a few remnants. The verb has a simple stem, a causative formed by a prefixed *a*, a second causative in *as*, a reflexive in *ta*, and another in *an*, a third in *tan*, and a causative reflexive in *ast*, each of these permitting five vowel changes to indicate shades of meaning. The indicative and the subjunctive of the imperfect are strictly distinguished. The vocabulary has been greatly enlarged by Hamitic words. There are also some Greek and Aramaic loan-words. Geez is to-day represented by two dialects, Tigre and Tigrai, or Tigrina. The latter is spoken in Tigre and has been much influenced by the Amharic; the former is spoken in the districts north and northwest of Tigre, and shows greater similarity to the old Geez. Amharic has developed many peculiarities not found in any other Semitic language, but characteristic of the Hamitic languages.

ETHIOPIC LITERATURE. Reference has already been made to the early inscriptions. On the translation of the Bible, see under BIBLE, the section on Versions. The Ethiopic Old Testament contains, in addition to the canonical books, also the Apocrypha (except the Books of Maccabees), and a number of works, such as the Book of Enoch, the Ascension of Isaiah, the Book of Jubilees, and the Apocalypse of Ezra. These additions have all been published; but many of the canonical books are extant only in manuscripts. Several apocryphal books are also appended to the New Testament, among them a *Synodos*, which includes canons of councils, an exposition of the Nicene Creed, Apostolic contributions, and other matter. The remaining literature is mainly theological, and includes translations of Greek fathers, liturgies, lives of saints, monastic rules, hymns, and the like. A so-called *Antiphonary* contains a musical notation. The *Savasev* are very imperfect studies of the language. The lists of kings are of considerable value, though the narratives are mostly drawn from Arabic writers. Numerous manuscripts are preserved in European libraries. Catalogues of the principal collections have been published. The Abyssinian monasteries are known to possess large numbers of manuscripts.

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Denkmälern (Leipzig, 1893); Maspéro, *Histoire ancienne des peuples de l'Orient classique* (Paris, 1895-99); Ludolf, *Historia Æthiopica* (Frankfort, 1681); Tellez, *Historia general de Ethiopia* (Coimbra, 1660); d'Almeida, *Historia de Ethiopia alta* (1624); Bosset, "Etudes sur l'histoire d'Ethiopie," in *Journal Asiatique* (Paris, 1881); Dillmann, *Ueber die Anfänge des Axumitischen Reiches* (Berlin, 1879); Perruchon, "Notes pour l'histoire d'Ethiopie," in *Revue Semitique* (Paris, 1893); Glaser, *Die Abyssinier in Arabia und Afrika* (Munich, 1895); Bent, *The Sacred City of the Ethiopians* (London, 1893); Bruce, *Travels in Abyssinia* (Edinburgh, 1768-73); Hoskins, *Travels in Ethiopia* (London, 1835); Dillmann, *Grammatik der Aethiopischen Sprache* (Leipzig, 1859); Prætorius, *Die amharische Sprache* (Halle, 1879); id., *Grammatik der Tigrina Sprache* (1871); Schriber, *Manuel de la langue Tigrini* (Vienna, 1887).

E'THIO'PIAN CHURCH. See Abyssinian Church.

ETHIOPIAN PEPPER. See Guinea Pepper.

ETHIOPIAN REGION. In zoögeography, Africa south of the Sahara, and including Madagascar; that is, the Paleotropical Region (q.v.). See Distribution of Animals.

E'THIOP'IC VERSION. See Bible.

ETHIOPIC WRITING. The language of the Semitic Ethiopians, the *lesana Geez* (see Geez), was at first written in the same characters that were used by the Minæans and Sabæans. The origin of this South Arabian system of writing is still obscure. While some epigraphists regard it as a modification of the Phœnician alphabet, others are inclined to ascribe to it an independent origin. (See Minæans.) The earliest Ethiopic inscriptions are written *boustrophedon*, i.e. as the ox plows, one line running from right to left, the next from left to right. Later the direction from left to right prevailed as in the Greek. Probably in the fourth century the Sabæan alphabet was modified by the introduction of a peculiar method of vowel notation. The various long or short vowel sounds were indicated by a lengthening or shortening of certain strokes or the addition of a stroke, a hook, or a circle. The signs thus became designations of syllables, and by 182 characters it was possible to express clearly the pronunciation of each word. It has been supposed by some scholars that this was an imitation of the Syriac vowel system. But the date of the Rüppell inscriptions renders it more probable that the changes were suggested by missionaries familiar with the Indian *brahma lipi* or *karoshthi* alphabets. As Buddhist missionaries seem to have visited Abyssinia before the introduction of Christianity, it is possible that this important alteration is due to one of them. But it may also be the work of Frumentius, who is said to have labored in India before coming to Aksum. If so, it is likely that the vowel notation was introduced between A.D. 340 and 360.

E'THIOPS (Lat., from Gk. Αἴθιοψ, *Aithiops*, Ethiopian; so called from the color), or Æthiops. A term applied by alchemists to certain black oxides and sulphides that were used in medicine. *Martial ethiops*, or black oxide, a ferrous and ferric oxide prepared by keeping iron filings under water, was used as a tonic. *Mineral ethiops*, mercuric sulphide with an excess of sulphur, was made by mixing together equal parts of mercury and sulphur in a stoneware mortar, and was used as a vermifuge and alterative. *Ethiops per se* was made by agitating mercury with access to the air. *Vegetable ethiops*, the plant bladder-wrack heated in a closed vessel until it became black, was used as a remedy for scrofula and similar diseases.

ETH'MOID BONE (Gk. ἠθμοειδής, *ēthmoeidēs*, like a sieve, from ἠθμός, *ēthmos*, sieve, from ἤθειν, *ēthein*, to sift + εἶδος, *eidos*, form). One of the eight bones which collectively form the cavity of the cranium. It is of a somewhat cubical form, and is situated between the two orbits of the eyes, at the root of the nose. Its upper surface is perforated by a number of small openings (whence its name), through which the filaments of the olfactory nerve pass downward from the interior of the skull to the upper part of the nose. It consists of two lateral masses, attached on each side of a vertical central plate or lamella, which articulates with the vomer and with the central fibro-cartilage, and thus assists in forming the septum or partition between the two nostrils. Each of the lateral masses is made up of two scrolls (turbinates) and is so planned as to give in a small space a very large amount of surface, on which the filaments of the olfactory nerve are spread. In comparative anatomy, we find a direct ratio between the development of these masses and the acuteness of the sense of smell. See Nose; Smell.

ETH'MYPHI'TIS. See Cellulitis.

ETH'NIC PSYCHOL'OGY. See Psychology.

ETHNOG'RAPHY (from Gk. ἔθνος, *ethnos*, people + -γραφία, *-graphia*, description, from γράφειν, *graphein*, to write). That branch of anthropology which is concerned with the systematic description of races and peoples. Ethnography may be described as the anthropology of those groups of human beings that have separate names—it may be a clan, a totem, a tribe, a nation, a race, or one of the great fundamental subdivisions of *genus homo*. There have been ethnographers from the very earliest times. Herodotus was an ethnographer, and so were Marco Polo and Mungo Park. A long line of pilgrims to the Holy City during the first millennium returned and narrated what they had experienced among the peoples whom they encountered, to their friends at home, and thus became ethnographers. The discovery of America and the exploration of the earth gave a powerful impulse to this branch of anthropology. The result of studies concerning the divisions of mankind in the middle of the last century gave rise to a number of ethnographical societies under different names, the object of which was to introduce system into what had been only desultory study. In England, France, Germany, Italy, Russia, and other European countries these associations have published journals, transactions, monographs, and guide-books of instructions to travelers and observers, the best of them being a little volume issued by the Anthropological Institute of Great Britain and Ireland, called *Notes and Queries for Anthropological Observers*, containing many sections on ethnography.

The ethnography of peoples embraces first the biology of each group, including observations and measurements of the living and studies of the dead, concerning color of the skin, hair, and eyes, the character of the hair, the form of the head, hands, feet, and other parts, and measurements of proportion in these parts. These results are shown in collections of anatomical specimens, in the gathering of photographs and drawings, and in the amassing of literature. The physiological processes in health and disease and physiological psychology form a part of this study. The *genus homo* may be subdivided on the basis of biology, and many attempts have been made in this direction. The commonest division makes five varieties, or subspecies, or races of man—the white, or Caucasic; the yellow, or Mongolic; the brown, or Malayic; the black, or Negroid; and the red, or American. But it is possible to separate mankind into groups upon the basis of those artificialities in life which together are called culture. Culture includes those activities which relate to food, drinks, narcotics, drugs, medicines, dress and adornment, habitations, furniture, mechanics, tools, primitive engineering, machinery, stone-working, ceramic art, metallurgy, wood-carving, textile industries, agriculture, milling arts, hunting, fishing, animal products, transportation by land and water, metrics, and commerce. These arts may all be classed under the general head of industrial, and men may be separated into groups industrially. Another class of activities is concerned with what all these various groups of mankind do to express their thoughts, giving rise to the whole class of languages, including vocal and written and sign language. It would embrace also every invention designed to impress ideas. In the third place, culture includes the purely social activities. In every sense it has been found that it is not good for men to be alone, so they unite their efforts first in the family, second in political organizations or government, third for protection in producing armies and navies, fourth in law-making, fifth in courts of justice, sixth in administration, including charity and pedagogics, and seventh in that unwritten law more potent than any legislation, called customs and conduct toward one another. A fourth class of artificialities is concerned with pleasure, or the æsthetic arts, including fine costume, music, graphic arts, sculpture and carving, ceramic art, textile art, art in metal, gardening and landscape, etiquette or the fine art of behavior, drama, oratory, and literature. A fifth set of artificialities is concerned with the progress of knowledge called sophiology, commencing with what is handed down by way of tradition, proverbs, or wisdom, in sayings, lore, and knowledge, the beginning of science and philosophy, or the explanation of all phenomena. The last class of artificialities to be mentioned here refers to the spirit world, what is believed, or creed, and what is done, called cult or worship. Included in this division of culture are the study of the pantheon, the organization of priesthood, the setting aside of sacred places, public worship, private worships with spiritual beings, and religious literature. Each one of the different peoples of the earth is set down in an environment which is, in a certain sense, the occasion of its culture, including the celestial environment, geologic environment, meteorologic environment, mineralogic environment, botanic environment, sociologic environment, and ethnic environment.

When a people has been studied in all of these respects the ethnographer hands his material over to the ethnologist, who classifies and arranges it in comparison with the same sort of information from other tribes, to formulate a science, just as the zoölogic philosopher works up the material of the naturalist. In each of the great nationalities special bureaus are charged with a study of the peoples within their respective territories. The Russian Government has done noble work in this direction. The English Survey of India is another triumph of coöperative ethnography. The Bureau of American Ethnology in Washington, D. C., is specially charged with accumulating ethnographic material with reference to every aboriginal tribe in the Western Hemisphere, especially those within the United States proper and Alaska.

ETHNOLOGY (from Gk. *ἔθνος, ethnos*, people + *-λογία, -logia*, account, from *λέγειν, legein*, to say). That branch of anthropology which treats of races and peoples, the natural and artificial divisions of the human species. The ethnologist investigates the natural history, psychology, industries, fine arts, language, sociology, knowledge, lore, and religion of single peoples, and adopts the comparative method among peoples to determine their origin and the sources of their culture. Beginning with man, this branch of science aims to find out the origin of the species, and also whether there is one or many species of the *genus homo*. Two views are held on this question: (1) there are several independent species of this genus; (2) there is but one species—the former view is called polygenism, the latter monogenism. It is much more probable that the human genus has one species with two or more subspecies, and these give rise to varieties or races.

The relation of environment—its atmosphere, its geosphere, and its hydrosphere, under the stimulus of the sun—to the human genus in producing varieties is another ethnological problem of vast moment. This opens up the entire question of classific concepts, stature, shape of head, color of skin and eyes, texture and color of the hair, intellectual qualities, and moral attributes. A biological question of greatest importance in this connection is that of the mixing of the races, its fruitfulness and results.

Ethnology, in dealing with the manifold activities of life, asks whether a given apparatus, or process, or production, found in peoples wide apart, had its origin in each independently by reason of a common humanity, or whether anciently there was commercial contact or perhaps blood connection. Hence springs up the inquiry about the antiquity and routes of migrations over the continents. All the trades, metric systems, mechanical devices, utensils, and the money or the medium of exchange in one people have their counterparts with other peoples. The common industries all culminate in fine art, and the relation of æsthetic methods and results to race or people suggests many puzzling questions. In ceramic and stone work, textiles, music, and etiquette, there are differences from race to race, but also startling resemblances, and these all lead the inquirer to ethnological studies.

One of the most important classific concepts of ethnology is speech, so that mankind have long been divided into families by their methods of expressing their minds. Languages and dialects each having a name have been classified for all the continents. The magnitude of the debt of the ethnologist to the comparative linguist is evident from the fact that most so-called ethnological atlases have a linguistic basis.

Another culture concept is derived from association of human beings in the ends of life. Its full consideration would lead to sociology in its widest sense. Here only ethnic sociology is in mind—the family among peoples, coöperative endeavor among peoples, government, custom, education, and charity among peoples. Here monogamy prevails, there polygamy, and in Australia a woman is the assigned wife of one man and the accessory wife of his clan brothers. Here is a vast empire, there a tribe, and all culture grades of the past surviving in the present—the state of savagery, stage of maternal kinship; the state of barbarism, stage of paternal kinship; state of civilization, stage of territorial law; state of enlightenment, stage of citizenship.

Again, the science of comparative religion has a place for ethnology. After defining its terms, tracing each element of creed and cult to its logical sources, ethnology attempts to solve the problem how the white races, the brown races, the black races treat these themes. For example, taking the Greek pantheon as the climax of polytheism, the task is to find the corresponding notion to each of its gods and ceremonies among the Teutonic, Celtic, and Mediterranean peoples, and passing outward and downward even to the lowest races, to account for many absurdities in the higher religions.

Most conscientious efforts have been made to arrive at a thoroughly scientific classification of mankind. In point of fact the naming of animal species becomes more difficult as the number of specimens examined increases. The history of the earlier efforts will be found in Topinard; a few of the latest are here given to make the series complete. Great care has to be exercised not to confound blood with speech, arts, social structure, or any other concept.

J. F. Blumenbach (1752-1840), on purely natural history characteristics, made five subspecies, varieties, or types of mankind: *Caucasian, Mongolian, Ethiopian, Malay*, and *American*. These have been further reduced in number by de Quatrefages to the three subspecies: Caucasian, or white trunk, 700,000,000; Mongolian, or yellow trunk (Mongol, Malay, American), 650,000,000; Negroid, or Ethiopian trunk, 230,000,000—total mankind, 1,580,000,000. Friedrich Müller took the texture of the hair as his chief concept, making two divisions of mankind: SMOOTH HAIR (Schlichthaarige) and WOOLLY HAIR (Wollhaarige); and four subdivisions: *Wavy hair* (Lockenhaarige), Mediterranean, Nubian and Dravidian race; *Straight hair* (Straffhaarige), Mongolian, Malayan, American, Hyperborean, and Australian race; *Woolly hair* (Büschelhaarige), Kaffirs and African Negro race; *Tufted hair* (Vliesshaarige), Papuan and Hottentot race.

Huxley used this concept under two divisions: Leiotriches, or smooth hair, and Ulotriches, or woolly hair. Of the former are (1) Australoids; (2) Mongoloids; (3) Xanthochroi (blonds), and Melanochroi (brunettes); all the remainder of mankind are woolly-haired.

Haeckel, who was a polygenist, adopted Müller's four main divisions, based on the character of the hair, making 12 species and 37 races.

The tendency of late years is to classify the species on anatomical characters, using stature and cranial measurements aided by anthropometric data gathered from the living. Topinard adopts the nasal index; Flower, the jaw; Welcker and many others, the ratio of the width to the length of the skull, which is found by multiplying the width by 100 and dividing by the length, so that

$$\frac{\text{width} \times 100}{\text{length}} =$$

cranial index of the skull, or cephalic index in the case of the living.

			RACES AND SUB-RACES
A. WOOLLY HAIR, BROAD NOSE			
Yellow skin, steatopygous, short stature, dolichocephalic.			*Bushmen* (sub-races Hottentots and Bushmen).
Dark skin		Reddish-brown, very short stature, sub-brachycephalic or sub-dolichocephalic.	*Negrito* (sub-races Negrillo and Negrito).
		Black, stature tall, dolichocephalic.	*Negro* (sub-races Nigritian and Bantu).
		Brownish-black, medium stature, dolichocephalic.	*Melanesian* (sub-races Papuan and Melanesian).
B. CURLY OR WAVY HAIR			
Dark skin		Reddish-brown, narrow nose, tall stature, dolichocephalic.	*Ethiopian.*
		Chocolate-brown, broad nose, medium stature, dolichocephalic.	*Australian.*
		Brownish-black, broad or narrow nose, short stature, dolichocephalic.	*Dravidian* (sub-races Platyrhine and Leptorhine).
Skin of a tawny white, nose narrow, hooked, with thick top, brachycephalic.			*Assyrioid.*
C. WAVY BROWN OR BLACK HAIR, DARK EYES			
Clear brown skin, black hair, narrow, straight or convex nose, tall stature, dolichocephalic.			*Indo-Afghan.*
Tawny white skin, black hair	Tall stature, elongated face	Aquiline nose, prominent occiput, dolichocephalic, elliptical form of face.	*Arab or Semite.*
		Straight, coarse nose, dolichocephalic, square face.	*Berber* (4 sub-races).
		Straight, fine nose, mesocephalic, oval face.	*Littoral European.*
	Short stature, dolichocephalic.		*Ibero-insular.*
Dull white skin, brown hair		Short stature, strongly brachycephalic, round face.	*Western European.*
		Tall stature, brachycephalic, elongated face.	*Adriatic.*
D. FAIR, WAVY OR STRAIGHT HAIR, LIGHT EYES			
Somewhat wavy, reddish; tall stature, dolichocephalic.			*Northern European.*
Somewhat straight, flaxen haired, short stature, sub-brachycephalic.			*Eastern European.*

		E. STRAIGHT OR WAVY HAIR, DARK, BLACK EYES	RACES AND SUB-RACES
Light brown skin, very hairy body, broad and concave nose, dolichocephalic.			*Ainu.*
Yellow skin, smooth body		Prominent nose, sometimes convex, tall stature, elliptical form of face, brachy- or meso-cephalic.	*Polynesian.*
		Short stature, flattened, sometimes concave, nose, projecting cheek-bones, lozenge-shaped face, dolichocephalic.	*Indonesian.*
		Short stature, prominent, straight or concave nose, meso or dolicho-cephalic.	*South American* (sub-races Paleo-American and South American).
		F. STRAIGHT HAIR	
Warm yellow skin	Straight or aquiline nose	Tall stature, meso-cephalic.	*North American* (sub-races Atlantic and Pacific).
		Short stature, brachycephalic.	*Central American.*
	Straight nose, tall stature, brachycephalic, square face.		*Patagonian.*
Brownish-yellow skin, short stature, round flattened face, dolichocephalic.			*Eskimo.*
Yellowish-white skin		Turned-up nose, short stature, brachycephalic.	*Lapp.*
		Straight or concave nose, short stature, meso- or dolicho-cephalic, projecting cheek-bones.	*Ugrian* (sub-races Ugrian and Yenisian).
		Straight nose, medium stature, strongly brachycephalic.	*Turkish* or *Turco-Tatar.*
Pale yellow skin, projecting cheek-bones, Mongoloid eye, slightly brachycephalic.			*Mongol* (sub-races Northern and Southern).

Consult: Deniker, *The Races of Man* (London, 1900); also Keane, *Ethnology* (Cambridge, 1896), where the family tree of the Hominidæ is worked out. The schemes of Brinton, Friedrich Müller, de Quatrefages, Topinard, Haeckel, Flower, and Kollman, will be found in the summaries of "Progress in Anthropology," published in the *Smithsonian Reports* from 1880 to 1891.

The latest classification published is Deniker's, who makes 29 races and sub-races of man in 5 main divisions: (A) *Woolly hair, broad nose;* (B) *Curly, or wavy hair;* (C) *Wavy brown or black hair, dark eyes;* (D) *Fair, wavy, or straight hair, light eyes;* (E) *Straight or wavy hair, dark, black eyes;* (F) *Straight hair.*

A (1) *Bushmen* (Hottentot and Bushmen sub-races).
(2) *Negrito* (Negrillo and Negrito sub-races).
(3) *Negro* (Nigritian and Bantu sub-races).
(4) *Melanesian* (Papuan and Melanesian sub-races).
B (5) *Ethiopian.*
(6) *Australian.*
(7) *Dravidian* (Platyrhine and Leptorhine sub-races).
(8) *Assyrioid.*
C (9) *Indo-Afghan.*
(10) *Arab or Semite.*
(11) *Berber* (4 sub-races).
(12) *Littoral European.*
(13) *Ibero-Insular.*
(14) *Western European.*
(15) *Adriatic.*
D (16) *Northern European.*
(17) *Eastern European.*
E (18) *Ainu.*
(19) *Polynesian.*
(20) *Indonesian.*
(21) *South American* (Paleo-American and South American sub-races).
F (22) *North American* (Atlantic and Pacific sub-races).
(23) *Central American.*
(24) *Patagonian.*
(25) *Eskimo.*
(26) *Lapp.*
(27) *Ugrian* (Ugrian and Yeneseian sub-races).
(28) *Turkish or Turco-Tatar.*
(29) *Mongol* (Northern and Southern sub-races).

The standard authorities on classification by physical characteristics are the following: Thomas H. Huxley, "Geographical Distribution of the Chief Modifications of Mankind," in *Journal of the Ethnological Society* (London, 1870); Friedrich Müller, *Allgemeine Ethnographie* (Wien, 1879); Hermann Welcker, *Die capacität und die drei Hauptmessungen der Schadel Kapsel* (Archiv für Anthrop., vol. xxi., 1886); William H. Flower, *Classification of the Varieties of the Human Species;* A. de Quatrefages de Brun, *Histoire générale des races humaines* (Paris, 1889); Ernest H. Haeckel, *Anthropogenie* (Leipzig, 1891); A. H. Keane, *Man: Past and Present* (Cambridge, 1899); J. Deniker, *The Races of Man* (London, 1900).

ETH'YL (from *eth-er* + *-yl*), C_2H_5. A radicle, or group of atoms, often found in chemical compounds of carbon, but incapable of independent existence. See CARBON COMPOUNDS.

ETH'YLAM'INE (from *ethyl* + *-amine*, from *am*-monia + *-ine*), $C_2H_5NH_2$. An organic base produced when a mono-halogen substitution product of the hydrocarbon ethane is heated with a solution of ammonia in alcohol. The most convenient method of preparing ethylamine consists in gently warming propion-amide ($C_2H_5CONH_2$, the amide of propionic acid) with bromine and an excess of caustic potash, the transformation taking place in two steps according to the following chemical equations:

1. $\underset{\text{Propionamide}}{C_2H_5CONH_2} + Br_2 + KOH =$
$$\underset{\text{Bromo-propionamide}}{C_2H_5CONHBr} + KBr + H_2O$$

2. $\underset{\text{Bromo-propionamide}}{C_2H_5CONHBr} + 3KOH =$
$$\underset{\text{Ethylamine}}{C_2H_5NH_2} + KBr + K_2CO_3 + H_2O$$

Ethylamine is a colorless, inflammable liquid boiling at 18.7°. It resembles ordinary ammonia in odor and in other properties; combines with acids to form crystalline salts; and forms double salts with the chlorides of gold, platinum, etc. When treated with nitrous acid it is changed to ammonia; and when warmed with chloroform and caustic potash, it is converted into ethyl-iso-cyanide (a carbylamine having the formula C_2H_5NC), which may be readily recognized by its extremely disagreeable smell. See also AMINES.

ETH'YLENE (from *ethyl* + *-ene*), or OLEFIANT GAS, C_2H_4. A gaseous compound of carbon and hydrogen having a peculiar sweetish odor. It is colorless and but sparingly soluble in water.

In the presence of 'platinum black' (finely divided platinum), it combines with hydrogen to form the hydrocarbon ethane. Ethylene is formed in the dry distillation of coal, and is therefore one of the constituents of ordinary illuminating gas, to whose flame it imparts considerable luminosity. It is prepared in chemical laboratories by heating a mixture of strong alcohol and concentrated sulphuric acid, the alcohol being thus broken up into water and ethylene.

Ethylene is one of those carbon compounds that are capable of combining directly with the halogens, forming 'additive products'; thus, with bromine it forms the compound $C_2H_4Br_2$. It is therefore classed with the so-called unsaturated compounds, of which it is the simplest representative.

ÉTIENNE, å'tyĕn'. See STEPHANUS.

ÉTIENNE DU MONT, å'tyĕn' du môɴ, SAINT (Fr., Saint Stephen of the Mount). One of the most beautiful churches of old Paris, founded in 1220 and rebuilt from 1517, but not completed till 1626. It has a beautiful carved transverse gallery in stone separating the choir from the nave, a feature which is unique in Paris. The church contains the shrine of Saint Geneviève, dating from the thirteenth century, and is the burial-place of Pascal and Racine.

ET'IOLA'TION (from Fr. *étioler*, to blanch, OFr. *estioler*, from *esteule*, stubble, from Lat. *stipula*, straw). The change in the appearance and structure of a plant caused by its growth in darkness. Lankness and pallor are the most noticeable differences from the normal. Pallor is a relatively superficial effect, and is due to the destruction or non-production of chlorophyll, the chloroplasts showing only a yellow pigment (etiolin), possibly one of the carotin group. Elongation of the stems and leafstalks, imperfect development of the blades, often a change in the mode of branching, and extensive internal modification of the tissues are more profound effects of absence of light. The mechanical tissues are particularly affected; the cell-walls, which normally thicken, remain thin, and the parts are consequently weak. The 'lodging' of grain is often due to the shading of the stalks (on account of thick sowing), so that the mechanical tissues are not developed to a sufficient degree to carry the ripening heads. This effect is sought in celery by blanching, the tenderness of the leafstalks depending upon the completeness with which the cell-walls are prevented from thickening with age. See CAROTIN.

ET'IOLIN (from Fr. *étioler*, to blanch). The pale-yellow pigment formed in the chloroplasts of a plant grown in darkness, or remaining after the destruction of chlorophyll by darkness. The relation of etiolin to carotin (xanthophyll) is not satisfactorily determined. It may be one of this group of pigments. It has been shown that the making of a small amount of carbohydrate food is possible through the presence of etiolin in chloroplasts. It seems uncertain and even unlikely that chlorophyll originates by the alteration of etiolin. See ETIOLATION; PHOTOSYNTHESIS.

ETIQUETTE, ĕt'ĭ-kĕt (OF. *estiquette*, *etiquette*, Fr. *étiquette*, from OHG. *stehhan*, Ger. *stechen*, to stick). Originally, etiquette signified a slip of paper affixed to a bag or other object to indicate its contents. The word came probably to possess the secondary meaning which we now attach to it, of the forms or decorums observed in the intercourse of life, more particularly on state occasions, from its having been customary to deliver such tickets, instructing each person who was to share in a ceremony as to the part which he was expected to play. The cards on which the order of the dances is set forth at balls and evening parties are of this nature.

ÉTIQUETTE, å'tê'kĕt', MADAME. The popular name applied to the Duchess de Noailles from her rigid application of formalities as mistress of ceremonies at Marie Antoinette's Court.

ETIVE, ĕt'ĭv. A sea-loch in the north of Argyllshire, Scotland, running inland from the Firth of Lorne (Map: Scotland, C 3). The river Awe, the outlet of Loch Awe, and the small River Etive flow into it. The loch abounds in salmon. The scenery around the upper half of the loch is mountainous and romantic. The ruins of Ardchattan Priory and of Dunstaffnage Castle add to its interest.

ET'LAR, CARIT. See BROSBÖLL, JOHAN CARL CHRISTIAN.

ET'NA, or **MONGIBELLO**, môn'jê-bĕl'lô (Lat. *Ætna*). The largest active volcano in Europe. It is an isolated mountain on the eastern coast of Sicily near the city of Catania. It is cut off from the surrounding mountains on the north by the valley of the Alcantara and on the south and southwest by the valley of the Simento. Its eastern side rises directly from the Mediterranean, which here has a depth of 5000 to 6000 feet. The base of the volcano measures about 90 miles in circumference. The ascent, gradual at first, leads with increasing slope to the summit, about 10,800 (according to a recent measurement, 10,738) feet above the sea. The general appearance of Etna is that of a massive lava cone, whose regularity of outline is broken by fissures and by numerous subsidiary cones. Of the latter there are more than 200 located at irregular intervals on the mountain-sides, some reaching a height of 700 feet. The cone occupied by the present principal crater rests upon a terrace which marks the site of an ancient larger cone that was probably destroyed by an explosion. On the eastern slope is a vast amphitheatre called the Val del Bove, with precipitous sides nearly 3000 feet high, which was once the centre of eruption and which affords a remarkable view of the volcano's structure and its development during the repeated eruptions. The summit of Etna, except where covered with snow, presents a dreary waste of dark lava, scoriæ, and ashes. Lower down there is a stretch of wooded region with pine, oak, beech, and poplar. A varying breadth of two to eleven miles of cultivated region surrounds its base, producing grain, oil, wine, fruit, and aromatic herbs. Snow persists throughout the year in the fissures of the summits, and on the exposed portions for about eight months. An observatory and a house for the convenience of travelers have been erected on the terrace just beneath the crater.

The eruptions of Etna are on a grander scale than those of Vesuvius, but they are not of so frequent occurrence. There are records of eleven eruptions previous to the Christian Era, the first occurring in B.C. 476 or 477. The most remarkable in later times are the following: the eruption of A.D. 1169, when Catania and 15,000 of its inhabitants were destroyed; that of 1527, when two villages were buried and many human beings perished; that of 1669, when the flow of lava was directed again toward Catania and is said to have killed 20,000 people; and the eruption of 1693, when a still larger number of people are said to have been destroyed. A violent eruption took place in 1852, and immense quantities of volcanic dust fell over the adjacent country. Great torrents of lava also issued from two new fissures on the eastern flank, one of which was nearly two miles in length. The next outbreak in 1864-65 was of trifling importance. That of May, 1879, was much more violent, the clouds of smoke and showers of ashes being followed by the ejection of a stream of lava which desolated a large tract of highly cultivated land. The latest eruptions occurred in 1886 and 1892. See SICILY.

ETNA. A borough in Allegheny County, Pa., on the Allegheny River, opposite Pittsburg, and on the Western Pennsylvania and the Pittsburg and Western railroads (Map: Pennsylvania, B 3). It is a flourishing industrial centre, and has rolling-mills, furnaces, steel-mills, galvanized-pipe works, and other manufactures. Population, in 1890, 3767; in 1900, 5384.

ETON. A town in Buckinghamshire, England, on the left bank of the Thames, 42 miles south-southeast of Buckingham, and 22 miles west of London (Map: London, E 1). It lies opposite Windsor in Berkshire, with which it is connected by a bridge over the Thames. Eton chiefly consists of one long, well-paved street, is lighted by electricity, and has a modernized sewerage system. It derives its importance from its famous historical college, Eton (q.v.). Population, in 1901, 3300.

ETON COLLEGE. One of the oldest and most famous public schools in England. It was founded in 1440 by Henry VI. as "The College of the Blessed Mary of Eton beside Windsor." The establishment was constituted for a provost, ten priests, four clerks, six choristers, twenty-five poor grammar scholars, a master, and twenty-five poor infirm men, and was provided for out of the royal demesne lands and the estates of certain alien priories. The whole plan was modeled on that of Winchester, and contemplated a connection between Eton and King's College, Cambridge (q.v.), such as existed between Winchester and New College, Oxford. In 1441 a supplementary charter was granted to the new foundation, and the college buildings were begun, but were not entirely finished until 1523. The first head-master of the school, later one of its most munificent benefactors, was Bishop Waynflete (q.v.). The college has had a long and honorable history. Its roll of worthies comprises many great names, especially during the eighteenth century. It includes Sir Robert Walpole, Robert Harley (Earl of Oxford), Henry Saint John (Viscount Bolingbroke), the elder Pitt, Lord North, Charles James Fox, Horace Walpole, the Duke of Wellington, the poets Gray and Shelley, and Gladstone. The increasing value of the estates of the college, together with additional gifts, has made it very wealthy. By the Public Schools Act of 1868, the original foundation was greatly modified. The governing body now consists of a provost and ten fellows, nominated by an electorate, which includes such bodies as Oxford and Cambridge universities. There are a number of scholarships besides those on the regular foundation, and the plan of connecting Eton with King's College was so far carried out that a number of scholarships at the Cambridge college are exclusively for Eton men. Scholars still reside in college, but the majority of the students, some 900 in all, live out of college. These are known as *oppidans.* There are two schools, an upper for the older boys, and a lower for the younger, managed by a head-master and an assistant, or lower master. The teaching force is large. Here, as at most English public schools, the education is largely classical, though here, as elsewhere, natural science, mathematics, history, the modern languages, and the like have made places for themselves in the last half century. The buildings are very beautiful. They consist of two groups, of which the older, containing the chapel, hall, and library, the apartments of the provost, master, and fellows, inclose two quadrangles. The boys' library and sleeping apartments form the new buildings attached to the northern side of the older group. Consult Gray, *Ode on a Distant Prospect of Eton* (London, 1747). For worthies of Eton consult Creasy, *Eminent Etonians* (London,1848), a series of brief biographies of its principal members, with a sketch of the college. For general history of the school consult Maxwell-Lyte, History of *Eton College* (London, 1889). See also MONTEM CUSTOM.

ETOROFU, ā̇-tō̇′rō̇-fōō, or **ITURUP,** ē′tōō-rōōp′. The largest of the Kurile Islands, belonging to Japan, situated between the islands of Kunashiri and Urupp and crossed by the meridian 148° E. Its area is estimated at over 2600 square miles. The island is of volcanic origin and contains an active volcano.

ETOSA LAKE. See KUNENE.

ÉTOURDI, ā̇′tōōr′dē̇′, L' (Fr., The Unmindful One). A five-act comedy by Molière, produced at Lyons in 1653. It is an early work, the first of his finished plays, and abounds in bright situations and lively dialogue.

ÉTRETAT, ā̇′tre-tā̇′. A fashionable watering-place in the Department of Seine-Inférieure, France, on the English Channel, 18 miles northeast of Havre. It is picturesquely situated at the foot of high cliffs, has a fine beach, casino, and bathing establishment, a Romanesque church, several hotels, and numerous attractive summer cottages. It is a favorite resort for literary men and artists, by whom its many beauties have been fully exploited. Population, in 1901, 1944.

ETRU′RIA. The people called by themselves the Rasena, by ancient writers Tyrrheni and Tusci, and in modern times Etruscans are among the mysteries of history. Though scattered at one time over a larger part of Italy, the centre of their power was in the region bordered on the north by the valley of the Arno, on the east and south by the Apennines and the Tiber. This was Etruria proper. There were also two other regions colonized by the Etruscans—the valley of the Po in the north and the plains of Campania in the south. They formed the most advanced civilization in central Italy before the dominion of Rome.

ORIGIN AND HISTORY. Critics do not agree as to the origin of the Etruscans. One school makes them come by land across the Rhætian Alps, with their earliest settlement in the north and inland. A second school believes them to have come by sea. Herodotus believed them to be Lydians. Some modern writers connect them with the Pelasgians or Hittites. They certainly appear to have come from Asia Minor. Their own legends place the beginning of their power in Italy in B.C. 1044. The discoveries in the necropolises of Etruria would place the rudest of the early tombs at a period only slightly subsequent to this date. For several centuries the tribe remained stationary and retired, probably in the region of Monte Amiata and the Ciminian forest, though there may have been other centres as well. Between the eighth and sixth centuries B.C. the tribe embarked on a career of conquest among the earlier nations of central Italy. The earliest cities to be subdued were those along the seaboard, such as Tarquinii and Cære, and only quite late did inland cities like Perusia and Arretium fall into their hands. The Etruscans in many cases appear to have found among the conquered a more advanced civilization, but their superior organization and vigor made them conquerors. They formed probably the governing class, an aristocratic oligarchy. For a time there were three separate Etruscan confederacies, each composed of twelve cities or States. The southern confederacy (Etruria Campaniana) included Capua and Nola; the northern (Etruria Circumpadana) Felsina, Mantua, Ravenna, and Hadria. The central confederacy alone counts in history as important, and included many more important cities than the necessary twelve: Tarquinii, Cære, Veii, Vulci, Volsinii, Falerii, Nepete, Sutrium, Populonia, Russellæ, Clusium, Vetulonia, Volaterræ, Perusia, Cortona, Arretium were the largest, and the twelve confederates are probably to be found among them, the list varying at different times. Each separate State was governed by magistrates annually elected, with the titles of Lucumo (lauchmê), Porsena (Purtevana), and Marunuch, chosen from the ranks of the hereditary priestly nobles. In times of war a single supreme chief was chosen—like Porsena of Clusium—and his bodyguard consisted of twelve lictors, one from each city, as symbols of his authority. This is another point of resemblance with the Hittites, whose confederacy was similarly organized. The laws, both religious and civil, were embodied from early times in a triple series of books (*libri disciplinæ*), the first being the *libri haruspicini,* treating of divination by sacrifice; the second, the *libri fulgurales,* on divination by lightning; the third, the *libri rituales,* of more general import, treating of the founding and consecrating of cities and buildings, of the organization of the people, of the army, and the State in times of peace and war. Etruria was noted as a hotbed of superstition and profligacy even after her downfall.

The Etruscans are closely connected with the earliest history of Rome, forming one of the three tribes, the latest (Luceres), and finally reaching supremacy under the Tarquins, when Rome stood at the head of the Etruscan League. After the expulsion of the Tarquins, the Etruscans sought to reëstablish them by force under the leadership of the Porsena of Clusium (B.C. 509 ?). At this time the Etruscan cities were great commercial centres; those situated at a little distance from the seaboard had their special ports: Cære had Pyrgi, Vetulonia had Telamon, Tarquinii had Graviscæ. Their onward march in companies was shown by their attack on the Greeks of Cumæ in B.C. 523. The keen rivalry for commercial mastery then pending between the waning Phœnicians and the Greeks led Carthage to seek an alliance with the Etruscans, whose fleet must have been powerful and in control of local commerce. The terms of this treaty gave Corsica to the Etruscans and Sardinia to the Carthaginians. At this time the inland conquests of the Etruscans were substantially completed. Their first great defeat came in 474, when Hiero of Syracuse punished them for assisting the Athenians by practically annihilating their sea power. Between this time and the final destruction of their independence by Rome, at the battle of the Vadimonian Lake in B.C. 283, were two centuries of steady political decay, marked by their defeat by the Gauls, who overran Etruria Circumpadana; by the Umbrians, who attacked on the east; by the Samnites, who subjugated Etruria Campaniana, and by the Romans, whose progressive stages of conquest were marked by the capture of Veii in B.C. 396 after ten years' siege, and by that of Falerii. But the practical nature of the Etruscans seems to have shown itself by the easy fashion in which they turned their downfall into a further opportunity for a life of ease and luxury without responsibility. But they felt the influence of the far higher civilization of Rome. Certainly up to the time of the Gracchi Rome could not compare in magnificence or wealth with any of the greater Etruscan cities.

CUSTOMS AND RELIGION. Judging from the monuments, the Etruscans were a short and thick-set people, with heavy features, much given to good living, games, and amusements. Dancing, music, and the theatre flourished; festivals were frequent and sumptuous. There was great love of pomp and ceremony and of rich costumes. The Roman use of the *toga picta* and *palmata* and of the *corono Etrusca* in the triumph, the lictors, the system of slavery and clientship, the love of theatrical and amphitheatrical shows, the organization into tribes, the system of divination, and many other important customs and beliefs were derived by the Romans from Etruria. The Etruscan pantheon, as we know it, is a late piece of patchwork. The supreme trinity was Tinia (Jupiter), Uni (Juno), and Menrfa (Minerva). Other principal deities were Sethlaus (Vulcan), Turan (Venus), Phuphlans (Bacchus), and Turms (Mercury). Mantus was the ruler of Hades with his consort Mania, assisted by Charun and the Furiæ. These *Dii consentes* had above them a series of nameless deities, inexorable as fate, probably the original Chthonian divinities before Greek influence began.

LANGUAGE. The obscurity of Etruscan history is due largely to the absence of any literature and to the present inability to decipher the known inscriptions. The Etruscan language is still a mystery. The alphabet is clear. It contains nineteen letters, derived from a Græco-Chalcidian prototype, which was first adopted along the southern seaboard. But critics have not yet even determined to what family the language belongs; the two principal theories are that it is Aryan or Semitic. Although about 6000 inscriptions have been found, they are nearly all (four-fifths) sepulchral and so short and largely composed of proper names that only about 200 other words have been detected. Only 15 inscriptions are bilingual, and these are of little use. The longest inscription, on the Perugia Cippus, contains 46 lines. A great deal is expected from the study of the recently discovered linen mummy-cloths at Agram, containing over 200 lines of an Etruscan book. It was recognized in 1891 by Professor Krall of Vienna. In such progress as has been made, the stages have been marked by Lepsius's study of the alphabet, by Corssen's first attempt at laying a scientific basis for linguistic study (*Die Sprache der Etrusker*, Leipzig, 1874), and by the subsequent studies of Pauli and Deecke, who hold opposite theories. A few facts are known. The Etruscan language expresses relationship, both by separate words and by suffixes; it possesses gender and enclitics; it does not distinguish accusative from nominative case; but has genitive (-s) and dative (-si or -thi) as well as plural (-r or -l).

Archæology and Art.—Architecture. It is through archæological excavation that nearly everything known about the Etruscans has been discovered. More is known of Etruscan engineering than of architecture. The cities were carefully laid out on a quadrangular plan, with well-fortified citadels and walls; the walls were strengthened by towers and double gates. The Etruscans themselves used tufa and other stones squared and laid in horizontal courses, but there is some dispute whether the polygonal and irregular cyclopean masonry of some cities in Etruria was built by them or another and earlier race, perhaps the Pelasgians (q.v.). The city of Marzabotto, in the Province of Bologna, is the best instance of an Etruscan colony, laid out in regular streets, with pavements, sidewalks, and drainage. The Servian wall in Rome is of Etruscan construction. On the other hand, Russellæ, Cosa, Vetulonia, Veii and other cities are built in the polygonal style. Almost nothing of their temple architecture remains. From Vitruvius, and the descriptions of the Temple of Jupiter Capitolinus in Rome, from remains at Alatri, Satricum, Segni, Norba, and Falerii, it is evident that the Etruscans, Latins, Volscians, and other tribes adopted their temple from the early Greeks, taking as form the early temple *in antis* (not peristyle), with very deep portico. The usual material was a wooden core, covered with terra-cotta, for columns, entablature, gables, etc., while the cella walls were of brick or stone. Hence, their easy destruction by fire and disintegration. Nearly all the remains consist of the terra-cotta ornaments, such as *antefixes* (q.v.), sculptured friezes, and gable statuary. Marble sculpture, on account of its weight, could never be used in connection with these light wooden structures, but terra-cotta sculpture was carried to great perfection between the fifth and third centuries, as is shown by the remains at Satricum, Falerii, and Luni, which are unique in plastic history, and in some cases purely Greek in style. The order employed was a modification of the Doric, called the Tuscan, the proportions of which, owing to the influence of the material, were much lighter; they can best be studied in Vitruvius and in early Roman examples copied from Etruscan buildings. In their tombs the Etruscans showed as much genius as the Greeks. Throughout Etruria they are large and early domical and vaulted tombs for great chiefs, which remind one of the tombs of the Homeric heroes and of the Lydian Alyattes. Such are those at Veii, Vetulonia, Vulii, Chiusi, discovered full of antiquities, mostly imported from the East. These all date from the eighth, seventh, and sixth centuries. To another class, and certainly to the Etruscans themselves, belong the flat-roofed tombs imitated from the house, of which fine series exist at Cære and Perugia, dating between the sixth and third centuries B.C. These were often painted like the Egyptian tombs, with frescoes, from which we gain our principal knowledge, not only of Egyptian funeral rites, but of their beliefs and daily life. No remains of royal palaces or of public buildings have come to light, so that there is but a meagre remnant of Etruscan architecture.

Sculpture. It is different with sculpture. In character Etruscan sculpture lacks beauty of style, poetry, and imagination. It is essentially utilitarian and material. Stone, bronze, and terra-cotta were used at a very early date. It is either in the tombs, as at Vetulonia, or above them that the early stone sculptures are found, in the form of statues or steles carved in relief to mark the site. During this early stage (seventh to sixth century), when Oriental influence dominated, there was a peculiar mixture of realism and archaic style, as shown in the great terra-cotta sarcophagi at the British Museum, the Louvre, and the Papa Giulio Museum in Rome, in which the husband and wife are represented in life-size figures reclining on the funeral couch in conversation, while scenes in low relief are carved on the faces of the sarcophagus. Later, marble came into use for sarcophagi. Sometimes it was painted, as in the wonderful sarcophagus at Florence of the Hellenic period (fourth century); but when the burial after incineration became the rule the small carved ash-urns were produced in thousands. The largest collections are in the Vatican, at Perugia, Florence, Corneto, etc. Their scenes are very instructive as to Etruscan mythology, but they show a great and growing dependence on Greek thought. Bronze sculpture was an Etruscan specialty. Even the Greeks recognized this fact and imported the Etruscan works. This was the case not only with statues, like the Mars of Todi and the Orator of Florence, with busts like the Brutus in the Capitol, and with statuettes innumerable, but with articles of furniture and decoration, such as candelabra, jewel-cases, the famous *cistæ*, and mirrors. The Ficorn cista, with its exquisite engraved scenes, belongs to a class not found elsewhere in the artistic world. Many of the mirrors also are beautifully engraved with figured scenes.

Minor Arts. The Etruscan tombs, beginning in the eighth century, are filled with a wealth of objects unparalleled except in Egypt, and excavations do not seem to exhaust their riches. Their contents, however, do not illustrate merely Etruscan, but ancient Oriental and Greek art as well, especially in the cities of maritime and southern Etruria. This is the case especially with gold jewelry (q.v.) and vase-painting (q.v.). It is now quite certain that a large part of what has generally been called Etruscan jewelry came to Etruria from Greece, and the great majority of Attic and other Greek vases have been recovered in this way. The tombs of Orvieto (Falerii) are especially rich in Greek vases, many of them signed. It is easy to distinguish the native Etruscan ware; not so easy the jewelry. Of the jewelry, arms, and armor there were two classes; that for use, and that made as a votive offering and for burial. The latter class was extremely fragile and light. The Etruscan women were famous for the amount and richness of their jewelry-wreaths and coronets, pins, earrings, necklaces, fibulas, breastplates, armlets, bracelets, and rings. The great use of jewelry, while commencing as early as the seventh century, seems not to have reached its climax until the fourth century. The Vatican has a great deal of the early jewelry. The Metropolitan Museum in New York has a fair collection of the middle and later periods. But by far the greatest in number and variety of the objects found are the earthenware vases. There is one class essentially Etruscan, with its centre of manufacture at Chiusi (Clusium); it is the black ware with raised ornamentation called *bucchero nero*. There is the greatest and most fantastic variety in form and figured ornament in this class when compared to the sober and limited shapes of painted vases of the Greek class. The Etruscans had tried imitating Egyptian and Phœnician ware, but with the importation of Corinthian painted vases in the seventh and sixth centuries and of Attic and other vases in the succeeding period, Greek mastery became supreme. The imitation is rarely perfect enough to deceive, but it is even closer than Phœnician imitations. One finds Etruscan echoes of all the Greek periods and schools of vase-painting down to the third century, including imitation of the schools of southern Italy. In all their work the Etruscans seem to have followed simply commercial instincts and love of luxury. They had no artistic feeling. Whatever realism occasionally gives interest to their sculpture is due to the same regard for beliefs concerning the future life as are found in Egypt. The Etruscans held the pre-Hellenic attitude toward art as explanatory, decorative, and useful, not serving a higher purpose, or for its own sake as beautiful. Therefore they missed, in their imitations, the true spirit of Greek art. It is certain that Greek artists occasionaly worked for and with them. Demaratus, the father of Tarquin, is said to have been a Greek artist from Corinth. Some of the paintings at Cære and Corneto must be by a Greek hand; also some of the terra-cotta temple sculptures. The artistic influence of Etruria upon Rome was paramount from the time of the Tarquins to the rise of Greek influence in the third century B.C. Even after that time it still lingers in the sarcophagus reliefs and statuary.

In two other branches the Etruscans produced imitative works of no higher order—scarabs, gems, and coins. The imitation of Egyptian and Phœnician cut gems began at an early date, but the material (paste, bone, etc.) was cheap and the workmanship poor. During the fifth century, however, archaic Greek gems were fairly well imitated, but after this period little was done. Coinage also, as in all central Italy, was late in reaching the artistic stage. The Greek silver standard (Attic standard of Solon) was adopted late in the sixth century, but the workmanship on the Etruscan coins remained inferior.

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ETRURIA, KINGDOM OF. A kingdom established in Italy by Napoleon I. in 1801, formed out of the Province of Tuscany, and assigned by him to the Bourbons of Parma. In 1808 it became a part of the French Empire, and in 1809 Napoleon's sister, Elise Bacciocchi, was made Grand Duchess of Tuscany. On the overthrow of Napoleon in 1814, Tuscany reverted to Ferdinand III., brother of Francis I. of Austria.

ETSCH, ĕtsh. See ADIGE.

ETTINGSHAUSEN, ĕt′tĭngs-hou′zen, KONSTANTIN, Baron von (1826-97). An Austrian paleontologist. He was born and educated at Vienna, and in 1854 was appointed professor of botany and of medical natural history at the Josephsakademie in Vienna, whence in 1870 he was called in the same capacity to Gratz. From 1878 to 1880 he was engaged by the British Museum in researches concerning its collection of fossil plants. To the study of nervation he devoted many of his principal works. Among them are *Physiotypia Plantarum Austriacarum*, in collaboration with A. Pokorny (2 vols. of text, and 10 vols. of copper plate illustrations, 1856-73); *Physiographie der Medizinalpflanzen* (with 294 imprints from nature, 1862); *Beiträge zur Erforschung der Phylogenie der Pflanzenarten* (7 books, 1877-30).

ETTLINGEN, ĕt′lĭng-en. A town of the Grand Duchy of Baden, Germany, on the Alb, about four miles south of Karlsruhe (Map: Germany, C 4). Its only building of note is the castle, built about 1730, on the site of an ancient Roman fortress. It has manufactures of paper, cotton, shirtings, velvet, vinegar, and parchment. Population, in 1890, 6547; in 1900, 8040. Ettlingen derives its origin from a Roman settlement. In 1227 it received municipal privileges and came into possession of the margraves of Baden. On July 9 and 10, 1796, it was the scene of the defeat of the French under Moreau by the Austrians under Archduke Charles. The vicinity of Ettlingen is rich in Roman remains.

ETTMÜLLER, ĕt′mụl′lẽr, ERNST MORITZ LUDWIG (1802-77). A German philologist. He was born at Gersdorf, Saxony, studied at Leipzig from 1823 to 1826, and in 1830 began to lecture at Jena on the German poets of the Middle Ages. In 1883 he was called to the gymnasium at Zurich, and in 1863 to the university there, as professor of German literature. He edited the literary remains of the Middle High German and Old Low German dialects. In 1850 appeared, under his editorship, an Anglo-Saxon chrestomathy, *Engla and Seaxna Scôpas and Bôceras*, and in the following year his *Lexicon Anglo-Saxonicum*.

He also gave his attention to the old Norse literature, as is shown by an edition of the *Vauluspâ* (1830), translations and a Norse reading book, and wrote several original poems.

ET′TRICK. A valley in the south of Selkirkshire, Scotland, watered by the Ettrick River, which rises near Ettrick Pen, 2258 feet high. The river runs 28 miles northeast and falls into the Tweed. Its chief affluent is the Yarrow, which runs 25 miles from the west through a beautiful and poetically celebrated vale. Ettrick Forest, a royal hunting tract, swarming with deer till the time of James V., included Selkirkshire and some tracts to the north. In Ettrick Vale, at Tushielaw, dwelt the celebrated freebooter or king of the border, Adam Scot, who was summarily executed by James V. James Hogg, the Scottish poet, known as "the Ettrick Shepherd," was a shepherd in this part of the country. Consult Craig-Brown, *History of Selkirkshire* (Edinburgh, 1886).

ETTRICK SHEPHERD, The. See Hogg, James.

"ET TU BRU′TE!" (Lat., And thou also, Brutus!). The words commonly believed to have been uttered by Julius Cæsar when struck by the hand of Brutus. There is, however, no ancient Latin authority for attributing them to Cæsar. The strong popular belief in their authenticity is a remarkable tribute to the genius of Shakespeare, who puts them into Cæsar's mouth at the moment of his fall (*Julius Cæsar,* III. i. 77). The words occur in other Elizabethan writers.

ETTWEIN, ĕt′vīn (1721-1802). A Moravian bishop. He was born of Waldensian ancestry at Freudenstadt, Württemberg, June 29, 1721; joined the Moravians 1739; was ordained 1746; came to America as a traveling evangelist and missionary to the Indians 1754, and preached in eleven of the Colonies, and to twelve Indian tribes. During 1776 and 1777 he was chaplain in the general hospital of the American forces at Bethlehem, Pa. Later he negotiated with Congress in behalf of the Christian Indians, and represented the Moravians in dealing with the Government. In 1784 he was consecrated a bishop; in 1787 he founded the Society of the United Brethren for Propagating the Gospel Among the Heathen, which is still active. He prepared a dictionary and phrase-book of the language of the Delaware Indians, and published an account of their customs, traditions, etc. He died at Bethlehem, Pa., January 2, 1802.

ET′TY, William (1777-1849). An English painter, born at York, March 10, 1777. In accordance with the wishes of his father, he served seven years of apprenticeship to a printer of Hull. He was, however, enabled to prosecute his studies in painting through the generosity of his uncle, William Etty, who in 1806 invited him to visit London. In 1807 he entered the Royal Academy School, studying under Fuseli, and he also studied privately for a year under Sir Thomas Lawrence. He copied a great deal from the old masters in the National Gallery, and was a constant student in the Life School of the Academy; which he continued to attend even after he had become an Academician. He paid a brief visit to Paris and Florence in 1816, and in 1822 he took a longer journey to Italy, spending most of his time in Venice. From his studies of the Venetian masters he acquired that excellence in color for which his works are chiefly known. He was made an honorary member of the Academy of Venice. On his return to England, in 1824, his "Pandora Crowned by the Season" was much applauded, and he was made a member of the Royal Academy in 1828. From this time he was very successful, and amassed a good competence. He resided in London until 1848, but on account of failing health he retired to York, where he died November 13, 1849.

Etty's best works are figure pieces, mostly on classical subjects. They are marked by a certain charm of color, his carnation being particularly good. The composition is also good, but the drawing is sometimes faulty, and his work lacks life and originality. He always endeavored to inculcate moral lessons by his pictures. He himself considered his best works to be "The Combat," the three "Judith" pictures, "Beniah, David's Chief Captain," "Ulysses and the Sirens," and the three pictures of "Joan of Arc." A number of his important works are in the National Gallery, the South Kensington Museum, and the National Gallery of Scotland.

Consult: his "Autobiography," in *Art Journal* (London, 1849); Gilchrist, *Life of W. Etty* (London, 1855); Cosmo Monkhouse, "Etty," *Dictionary of National Biography* (London, 1889).

ET′YMOLOG′ICUM MAG′NUM (Lat., great etymological work). The name commonly given to a Greek lexicon which dates from the early part of the tenth century A.D. The compiler is unknown, but the work was based on a similar work of the ninth century, which should properly bear the title, and another lexicon similar to the extant *Etymologicum Gudianum.* The ninth century etymologicum no longer exists uncontaminated by later additions, but it is clear that it preserved in purest form the basis of the numerous Byzantine etymologica which have been transmitted to us. These all profess to give the etymologies of the words contained in them—hence the name. In spite of the fanciful derivations they often contain much valuable material. On the whole subject, consult Reitzenstein, *Geschichte der griechischen Etymologika* (Leipzig, 1897). The best edition of the *Etymologicum Magnum* is by Gaisford (Oxford, 1848). The *Etymologicum Gudianum* and others are edited by Sturz (Leipzig, 1816-20).

ET′YMOL′OGY (Lat. *etymologia,* from Gk. ἐτυμολογία, from ἔτυμος, *etymos,* true + -λογία, *-lògia,* account, from λέγειν, *legein,* to say). That branch of philology (q.v.) which deals with the derivation of words and with their comparison in different members of the same language-group. In its relation to the other great subdivisions of linguistic science, phonology, morphology, and syntax, etymology stands in closest association with phonology. Without rigid scientific adherence to phonetic law (q.v.) there can be no real etymology. On the other hand, phonology in its non-physiological aspect is based on etymology. The earliest of all the branches of linguistics to attract attention was etymology. The word was first used as a philosophical, not as a linguistic term. The Greek Stoics, in their disputations with the Skeptics, asserted that language existed by nature, not by convention. Words were therefore real (Gk. ἔτυμος), and it was the task of etymology, according to the Stoic view, to prove this reality. It is, however, noteworthy that long before the foundation of the Stoic School, Plato (q.v.) made an approximation to the modern method in his *Cratylus*. Not only does he there set forth for the first time the elemental divisions of Greek phonology, but he intentionally etymologizes. Thus, he correctly connects *γυνή*, woman, with *γονή*, seed, and going a step further he declares that the words for fire (*πῦρ*), water (*ὕδωρ*), and dog (*κύων*) are almost the same in Greek as in Phrygian, which we now know to be related to the Armenian (cf. Armenian *hur*, fire, *get*, water, *šun*, dog). Independently of Greece, India developed a study of language far more exact and thorough than any other ancient people ever did. As in Greece etymology had sprung from philosophy, in India it had its basis in religion. The first formal treatise on etymology in Sanskrit is Yaska's Nirukta (literally, outspoken), which dates perhaps from as far back as the fifth century B.C. The Nirkuta, which ranks as one of the six Vedangas, or members of the Veda, was composed to explain hard words in the Rigveda. The stress laid upon the source and meaning of the words, both in India and in Greece, is highly significant of the practical value of etymology. It is safe to affirm that without etymology there can be no exact orthoëpy. Exactness in the use of words is in direct proportion to the exactness of knowledge of their meaning, and exactness of knowledge of their meaning is in its turn in large measure conditioned by exactness of knowledge of their origin. Again, the attempt to etymologize is found in the earliest literary records. The Indian Yajur Veda (q.v.) abounds in these primitive etymologies, many of which are extremely naïve and erroneous (as the story that the deity Prajapati swelled up, *aśvayat*, and from this swelling, *śvayatha*, came the horse, *aśva*), while others are still deemed correct (as when by day, *divā*, Prajapati created the gods, *dēvās*, "for that is their godhead," *dēvatvam*). In the Bible *Eve* (Heb. *Ḥawwa*, Gen. iii. 20) is popularly derived from *ḥāwā*, to be, and in Gen. ii. 23, *ishsha*, woman, is explained as a derivative of *īsh*, man. This primitive kind of etymology is still common, and is known as popular, or better as folk-etymology. It is sometimes right, and as frequently wrong. Often among those who are unacquainted with the history of words, there will be found attempts to etymologize them as being related to others to which they may have some phonetic or, less commonly, some graphic resemblance. Examples of this are exceedingly numerous. Thus, German *Wahnwitz*, frenzy, is popularly associated with *wähnen*, to think, especially to think incorrectly, whereas it really signifies, as the Old High German form *wanawizzi* shows, witlessness, the first component being *wana*, without. Another instance is German *Sündflut*, deluge, connected popularly with *sünden*, to sin, but which is really derived from *sinvluot*, great flood. In English we have words like *bridegroom* (shortened also into *groom*), really bride's man (Anglo-Saxon *brydguma*), associated with *groom; island*, properly isle-land (Anglo-Saxon *ēg-lond*), which has been explained as land like an eye in the waters; *crayfish* (French *écrivisse*, crab), which is supposed to be a sort of fish, or *asparagus* (Gk. *ἀσπάραγος*), which becomes *sparrow-grass* in rustic speech. Abortive as many of the popular etymologies are, they are none the less important as indicating the universal need, felt by such as employ language, for some sort of explanation of the meaning of the words they use.

With the discovery of the importance of Sanskrit (q.v.) in linguistic investigation, and the rise of the science of comparative linguistics (see PHILOLOGY), etymology was placed on a scientific foundation. Its history is connected inseparably with the branch of learning of which it forms a part, but its method may be briefly outlined. First and foremost there must be a strict adherence in all etymological investigation to the principles of phonetic law (q.v.). The etymology which fails to conform to these laws must receive overwhelming confirmation from other quarters before it can be regarded as even possible. In the case of loan words phonetic law is apparently violated, and it will frequently happen that a language will have two or more words derived from a single word, one being the regular phonetic development and the other a borrowed form. In this case the latter form, known by the French term *mot savant*, is usually differentiated in meaning from the former. Thus we have in French and English such words as *royal* and *regal*, both from the Latin *regalis*, kingly; the form *regal* being borrowed directly from the Latin, while *royal* (cf. French *roi*, king, from the Latin accusative *regem*) is the phonetically correct form. Loan words may also undergo the regular sound-changes of the language into which they have been adopted. Thus, Latin *pondus*, pound, appears in Gothic and Anglo-Saxon as *pund*, with unchanged consonants, but in Old High German it is subject to the action of Grimm's law (q.v.) and becomes *phunt*. It is therefore evident that in etymology attention must be paid to the history of words, and sometimes to the records of the tribes speaking them. Thus, the English *wise* is akin to the Gothic *unweis*, unwise, Old High German *wis*, New High German *weise;* but *wise* is also a doublet of *guise*, which is the form assumed by *wis* in the Romance languages, which borrowed the word from their Germanic invaders. If it is true that the same word may assume different forms in the same language, it is equally true that different words may become identical in form in a given language. The large class of homonyms in every language is sufficient proof of this. An excellent English example of this phenomenon is *sound*, which is a conglomerate of four originally distinct words—namely, Anglo-Saxon *gesund*, hearty, Anglo-Saxon *sund*, a body of water, Latin *sonus*, noise, and Latin *subundare*, to dive beneath the waves. It is probable that many instances in which a word shows extraordinary diversity of meanings are to be traced to this process of conglomeration rather than to semasiological developments. (See SEMASIOLOGY.) It is, however, in the tracing of words back through an entire group of cognate languages to a hypothetical original form, denoted conventionally by an asterisk (*), that etymology finds its principal application. The older etymologists made wild guesses in their primitive investigations, and such etymologies are still made by untrained minds. Thus, Latin *deus*, god, Old Latin *deivos*, akin to Sanskrit *dēva*, god, has been connected with English *devil*, from Greek *διάβολος*, slanderer, and English *god*, in addition to the old stock comparison with *good*, with which the word has no etymological relation, has been equated with Sanskrit *gūḍha*, hidden. It is true that many etymologies which are perfectly sound seem at first sight impossible to those who are not acquainted with phonetic laws and the principles of word-formation. It is also true that many etymologies which are very plausible to students of comparative linguistics are in reality doubtful and accepted only provisionally. Such etymologies may ultimately be discarded, just as the provisional assumptions often accepted by investigators in the exact sciences are discarded, if further research shows them to be false.

Etymology may be confined to a specific group of languages or dialects. We may thus speak of Romance etymology, where words in the Romance languages are traced back for the most part to folk-Latin originals (as French *même*, self, Old French *meisme*, Provençal *medesme*, Old Provençal *smetessme*, Spanish *mismo*, Italian *medesimo*, from folk-Latin *semetipsissimum*), Germanic, Celtic, Indo-Iranian etymology, and the like. All these are combined in Indo-Germanic etymology. Similarly, we may have Semitic, Dravidian, Uralo-Altaic, or Polynesian etymologies, but Indo-Germanic is the most thoroughly systematized of all, and serves as a model for the rest. It must be borne in mind, however, that accidental resemblance of sound is no proof of etymological kinship. It is, consequently, unscientific to compare, as some have done, Semitic or Dravidian with Indo-Germanic words. The fact, for example, that Latin *taurus* sounds like Arabic *thaur*, both meaning bull, or English *sheriff* (Anglo-Saxon *scīr-gerēfa*, shire-reeve) resembles in sound the Arabic *sharīf*, exalted, also used of an official of a city, implies no relationship. Within a language group the same statement holds true. Sanskrit *sūpa*, broth, has no connection with English *soup*, nor are the English verbs *drag* and *draw* akin. As an example of etymological procedure, we may take the word for ten in the Indo-Germanic languages. Thus we have English *ten*, Anglo-Saxon *tyn*, Old Saxon *tehan*, Icelandic *tíu*, Gothic *taíhun*, Old High German *zehan*, New High German *zehn*, Old Irish *deich*, Irish *déag*, Gaelic *deug*, Cornish *dek*, Breton *dec*, Latin *decem* (whence the Romance group, Italian *dieci*, Spanish *diez*, Old French *dis*, French *dix* etc.), Umbrian *desen-duf* for * *deçem-duf*, twelve (ten-two), Greek δέκα, Old Church Slavic *desętĭ*, Czech *desátý*, Polish *dziesiąty*, Russian *désyatĭ*, Lithuanian *dēszimtis*, Lettish *desmit*, Old Prussian *dessīmts*, Armenian *tasn*, Albanian *δjetε*; Avesta, *dasa*, New Persian *dah*, Afghan *las*, Shighni *δīs*, *līs*, Sanskrit *daśan*, Prakrit, Pali, *dasa*, Hindi *das*, Marathi *dahā*. A comparison of all these forms, and more which might be added to the list, results in the postulation of a pre-Indo-Germanic form **deḱṃ*, to which, in accordance with the sound-laws governing the various divisions of the Indo-Germanic languages, and with reference to the principles of word-formation (as in the *-ti-* formation in Old Church Slavic, Czech, Polish, Russian, Lithuanian, Lettish, and Old Prussian in the example quoted) the various forms of the numeral ten are referred as to a convenient formula. (See PHILOLOGY.) The scope of etymology has been immensely widened by the theories of root-determinatives and root-extensions, and by the doctrine of the dissyllabic base or root (see PHILOLOGY), which have rendered possible the explanation of many words whose derivation had before been unknown.

Consult: Pott, *Etymologische Forschungen auf dem Gebiete der indogermanischen Sprachen* (Detmold, 1859-74); Fick, *Vergleichendes Wörterbuch der indogermanischen Sprachen* (3d ed., Göttingen, 1874-76; 4th ed., incomplete, 1890-94); Gray, *Indo-Iranian Phonology* (New York, 1902); Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der altindischen Sprachen* (Amsterdam, 1898-99); Bartholomæ, *Altiranisches Wörterbuch* (Strassburg, 1903); Hübschmann, *Etymologie und Lautlehre der ossetischen Sprache* (Strassburg, 1887); Horn, *Grundriss der neupersischen Etymologie* (Strassburg, 1893); Meyer, *Etymologisches Wörterbuch der albanesischen Sprache* (Strassburg, 1891); Hübschmann, *Armenische Grammatik* (I. Theil, Leipzig, 1895); Curtius, *Grundzüge der griechischen Etymologie* (5th ed., Leipzig, 1879); Prellwitz, *Etymologisches Wörterbuch der griechischen Sprache* (Göttingen, 1892); Meyer, *Handbuch der griechischen Etymologie* (Leipzig, 1901 et seq.); Vaniček, *Etymologisches Wörterbuch der lateinischen Sprache* (2d ed., Leipzig, 1881); Bréal and Bailly, *Dictionnaire étymologique latin* (Paris, 1885); Miklosich, *Etymologisches Wörterbuch der slawischen Sprachen* (Vienna, 1886); Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der gotischen Sprache* (2d ed., Amsterdam, 1900); Kluge, *Etymologisches Wörterbuch der deutschen Sprache* (6th ed., Strassburg, 1899); Franck, *Etymologisch woordenboek der nederlandsche taal* (The Hague, 1884-92); Tamm, *Etymologisk svensk ordbok* (Stockholm, 1891); Dietz, *Etymologisches Wörterbuch der romanischen Sprachen* (2d ed., Bonn, 1861-62); Körting, *Lateinisch-romanisches Wörterbuch* (2d ed., Paderborn, 1901); Coelho, *Diccionario manuel etymologico da lingua portugesa* (Lisbon, 1890); Brachet, *Dictionnaire étymologique de la langue française* (2d ed., Paris, n. d.); Scheler, *Dictionnaire d'étymologie française* (Paris, 1880); Müller, *Etymologisches Wörterbuch der englischen Sprache* (2d ed., 2 vols., Cöthen, 1878); Skeat, *Principles of English Etymology* (2 vols., Oxford, 1887-91); *Etymological Dictionary of the English Language* (3d ed., Oxford, 1898); Palmer, *Folk-Etymology* (London, 1882); Osthoff, *Etymologische Parerga* (Leipzig, 1901).

ETYMOLOGY, FIGURES OF. Terms employed in etymological discussions. They must be carefully distinguished from the figures of rhetoric or speech, of prosody, and of syntax, although there are instances in which the different classes overlap. The most important figures of etymology are as follows: Aphæresis (Gk. ἀφαιρεσις, a taking away) is the loss of the initial letter or syllable of a word, as Sanskrit *stha*, 'ye are,' but Greek ἐστέ, Latin *estis;* Sanskrit *kuddāla*, hoe, but Singhalese *udalu;* English *'low* for *allow*. Apocope (Gk. ἀποκοπή, a cutting off) is the same process at the end of a word as Greek πάρ, 'beside,' beside παρά (cf. Sanskrit *pár*); Latin *fac*, 'do,' beside *face;* French *bel*, 'beautiful,' but Latin *bellum;* Old High German *hirti*, 'shepherd,' but German *Hirt;* Avesta *raoγna*, 'oil,' but Kashani Persian *rō*, beside *ruγan*. This phenomenon is due in almost every case to the weakening and ultimate disappearance of the final vowel or syllable on account of the stress-accent in the preceding part of the word. Assimilation (Lat.

assimilatio, similarity) is the change undergone by sounds to make them harmonize with other sounds in the same word, and it may be either regressive, assimilating the second sound to the first, as Greek κλυτύτατος, 'sweetest,' beside γλυκύτατος, Latin *quinque*, 'five,' but Greek πέντε; or progressive, assimilating the first sound to the second, as Greek Θέθις, name of a sea-goddess, beside Θέτις; Old Church Slavic *mraviya*, 'ant,' but Greek μυρμηξ. Contamination (Lat. *contaminatio*, defilement) is a composite but not compound word, influenced by different words, as German *heischen*, 'to demand,' which is a contamination of Old High German *eiscôn*, 'to demand,' and *heizzan* (German *heissen*), 'to call.' It is sometimes difficult to draw the line between contamination and the far more frequent phenomenon of analogy (q.v.). Contraction (Lat. *contractio*, a drawing together) is the coalescence of two or more vowels into one, as Greek τιμῶμεν, 'we honor,' for *τιμάομεν; τιμῷμι, 'I should honor,' for *τιμάοιμι; Latin *copia*, 'abundance,' for **co-opia*. Crasis (Gk. κρᾶσις, mixture) is the combination of two vowels into one, this change being in most cases only an artificial subdivision of vowel-contraction, as Greek φροῦδος, 'vanished,' for τρὸ ὁδοῦ; Latin *cunctus*, 'all,' for **coiunctus*. Dissimilation (from Lat. *dissimilis*, unlike) is the reverse of assimilation, treated above, and is therefore the change undergone by sounds to make them different from other sounds in the same word, either regressively, as Greek θηλητήρ, 'hunter,' beside θηρητήρ; Italian *veleno*, 'poison,' beside *veneno;* or progressively, as Latin *fraglo*, 'I burn,' beside *fragro;* Old High German *turtultûba*, English *turtle-dove*, but Latin *turtur;* dialectic Italian *lumero*, 'I count,' beside *numero*. Dissimilation often involves loss of sounds, as Latin *mamor*, 'marble,' beside *marmor;* Spanish *cribo*, 'sieve,' but Latin *cribrum;* Sanskrit *tiṣṭhati*, 'he stands,' but Avesta *hištaiti*, Latin *sistit;* Latin *spondeo*, 'I pledge,' but perfect *spopondi*. This tendency forms the basis of Grassmann's law (q.v.). Epenthesis (Gk. ἐπένθεσις, insertion), or more scientifically, anaptyxis (Gk. ἀνάπτυξις, unfolding), is the insertion of a letter or syllable, as Latin *drachuma*, from Greek δράχμη, 'drachma,' μεσημβρία, *midday*, for *μεσημ(ε)ρία; English *umberella* for *umbrella*. Gemination (Lat. *geminatio*, a doubling) is a doubling of consonants, as Greek ἰσχυρρός, 'strong,' beside ἰσχυρός; Latin *cuppa*, 'tub,' beside *cupa;* German *Himmel*, 'heaven,' beside Middle High German *himel*. It is normally accompanied by the shortening of a preceding long vowel. Haplology (from Gk. ἀπλόος, simple, and λόγος, word) or haplolaly (from Gk. ἀπλόος simple, and λαλία, speech) is the suppression of one of two homophonous syllables in a word, as Greek ἀμφορεύς, 'pitcher,' for *ἀμφιφορεύς; Latin *semodius*, 'half-peck,' for **semimodius;* English *dynometer*, beside *dynamometer*. Hiatus (Lat., gap) is the juxtaposition of two or more vowels without contraction, as Greek προάγω, 'I lead forth'; Latin *ea*, 'she,' Gothic *aíáuk*, 'I increased,' from *aukan*. Metathesis (Gk. μετάθεσις, transposition) is the transposition of letters in a word, one of the most frequent of all the figures of etymology, as Greek κάρτος, 'strength,' beside κράτος; χιτών, 'tunic,' beside κιθών; Latin *sterno*, 'I strew,' beside the perfect *stravi; lerigio* 'religion,' beside *religio; coacla*, 'sewer,' beside *cloaca;* Italian *crapa*, 'goat,' beside *capra; grolia* 'glory,' beside *gloria*. As will be seen from the examples quoted, metathesis affects especially the liquids *r* and *l*, but we also have such changes as Sanskrit *sakaṭa*, 'stupid,' Pali *kasaṭa;* Sanskrit *śayana*, 'bed,' Singhalese *yahana*. Paragoge (Gk. παραγωγή, addition) is the addition of one or more inorganic letters to the end of a word. In Greek the so-called 'ny movable' (Greek νῦ ἐφελκυστικόν), which is added especially to words ending in -σι, and to verbs with the third person in -ε before vowels (as πᾶσι δίδωσι ταῦτω, 'he gives these to all,' but πᾶσιν ἔδωκεν ἐκεῖνα, 'he gave those to all'), perhaps may be placed here superficially. An English example is the paragogic *r* in such words as *law-r*. This phenomenon is usually caused by the desire to avoid a hiatus, but is often etymologically justified, as in the case of the French *a-t-il*, 'has he?' beside *il a*, 'he has' (folk Latin *habet-ille*, beside *ille habet*). Prothesis (Gk. πρόθεσις, a placing before) is the prefixing of an inorganic sound to a word, as Greek ἐρυθρός, 'red,' but Latin *ruber;* Armenian *erek*, 'evening,' but Sanskrit *rajas;* Sanskrit *ulōka*, 'world,' beside *lōka;* Avesta *aēšma*, 'wrath,' but Persian *xišm;* Latin *status*, state, but Spanish *estado*, Old French *estat*, French *état;* Cockney English *Hi* for *I*. Simplification (from Lat. *simplex*, simple, and *facere*, to make) is the reverse of gemination, treated above, and consists in the substitution of a single consonant for a repeated or double one, as Greek μέσος, 'middle,' beside μέσσος; Latin *vacilo*, 'I waver,' beside *vacillo;* Old High German *doufene*, 'to dip,' beside *doufenne*. Syncope (Gk. συγκοπή, abbreviation) is the omission of a letter or syllable from the interior of a word, as Greek πατρός, 'of a father,' beside πατέρος, Latin *præbeo*, 'I offer,' for **præhibeo*, **præhabeo;* Provençal *anma*, 'soul,' from Latin *anima;* Sanskrit *laśuna*, 'onion,' but Singhalese *lūnu;* Anglo-Saxon *nolde*, 'would not,' for **ne wolde* (cf. English *nilly-willy*); English *wondrous* beside *wonderous*. Tmesis (Gk. τμῆσις, division) is the separation of the parts of a word, especially a compound, by another word. This is properly only an apparent figure. It had its origin in verbs compounded with prepositions, and as prepositions are originally stereotyped case-forms of nouns used adverbially (see Prepositions), the union was at first only a very loose one, as in English *overbear* beside *bear over*. As examples may be cited Greek ἐπὶ κνέφας ἦλθεν, 'darkness came on,' for κνέφας ἐπῆλθεν; Latin *sub vos placo*, 'I implore you,' for *supplico vos;* and such a monstrosity as *cere-comminuit-brum*, 'he dashed out his brains,' for *cerebrum comminuit*. In German this tmesis is subject to regular laws, as *er führte seinen Entschluss aus*, 'he carried out his resolution,' but *ich sagte, dass er seinen Entschluss ausführte*, 'I said that he carried out his resolution.' As the antiquity of the terms implies, the majority of the figures of etymology were known to the classical grammarians, although the full explanation of them has been rendered possible only by the development of comparative linguistics (see Philology, Comparative), especially of that branch of it which deals with etymology (q.v.).

ETZEL, ĕt'sel. See Attila.

EU, ē (ML. *Auga*, *Augium*). A town in the Department of Seine-Inférieure, France, near the mouth of the Bresle, 93 miles north-northwest of Paris (Map: France, H 2). It is remarkable for its fine Gothic church and for the Château d'Eu, a low seventeenth-century building of red brick, with high, tent-shaped roofs of slate. Louis Philippe expended large sums on the embellishment of the château, which he inherited in 1821, and especially on its magnificent park and the unique portrait-gallery. Eu manufactures sailcloth, ropes, soap, lace, and silk. Population, in 1901, 5398. Consult: Vatout, *Le château d'Eu, notices historiques* (Paris, 1836); id., *Résidences royales* (Paris, 1839).

EU, Prince LOUIS PHILIPPE MARIE FERDINAND GASTON D'ORLÉANS, Comte d' (1842—). A Brazilian soldier. He was born in France, the eldest son of the Duc de Nemours and the grandson of Louis Philippe. In 1864 he was married to Isabel, heiress apparent to the throne of Brazil. He was a marshal in the Brazilian Army, and was commander-in-chief of the allied forces in the war with Paraguay, which he brought to a successful termination in 1870. During Emperor Dom Pedro's long visits to Europe, the Comte d'Eu had the direction of Brazilian affairs, but he became very unpopular, owing to his ultra-clerical views, and, after the proclamation of the Republic in 1889, retired to France.

EUA, â-o͞o′â. One of the Tonga or Friendly Islands (q.v.), situated about 10 miles southeast of Tongatabu, in latitude 21° 25′ south, and longitude 174° 50′ west. It is about 15 miles long by eight miles wide. Its surface is rugged; the highest elevation, however, reaches an altitude of but 600 feet.

EUBŒ′A, *MGk. pron.* ĕv′vĭ-â (Lat., from Gk. Εὔβοια, *Euboia*, rich in cattle, from εὖ, *eu*, well + βοῦς, *bous*, ox, cow; unofficial modern Gk. and Turk. *Egripo;* It. *Negroponte*). A long, narrow island of Greece, stretching along the northeast coast of Locris, Bœotia, and Attica, from which it is separated by a narrow channel, the northwestern part of which is the channel of Atalante (the Eubœan Sea of the ancients) and the narrowest part of the strait to which the ancients gave the name of Euripus. At Chalcis the Euripus contracts to a width of a few rods. At the north the Channel of Trikeri separates Eubœa from Thessaly, of whose eastern mountains, Ossa and Pelion, the Eubœan range is a continuation. The extreme length is about 100 miles, and its breadth varies from 30 miles to about four. The island is intersected by a chain of mountains running northwest and southeast, and attaining in the centre in the range of Mount Delphi (Gk. Δέλφη, ancient Δίφρυς), an elevation of about 5725 feet. In ancient times copper and iron were mined in the island, and Carystus was the source for the green and white Cipollino marble, much used in ancient Rome. The mountains are still well wooded, and in the north are hot sulphur springs, much sought in ancient and modern times for their medicinal qualities. There is an abundance of good pasturage, and the valleys on the west coast are fertile, especially the famous Lelantian Plain, between Chalcis and Eretria, for the possession of which those cities waged a long war. The chief products are oil, wheat, fruit, and honey. The inhabitants are chiefly engaged in the breeding of cattle; they export wool, hides, and cheese, as well as oil and grain. The chief towns are Chalcis (q.v.) on the Euripus and Carystus on the south coast. Greek tradition told of Abantes and Dryopes as the earliest inhabitants, who were joined by Ionians from Attica, and founded the chief ancient cities of Chalcis and Eretria, which attained such prosperity as to send colonies to Italy, Sicily, and especially to Chalcidice, on the coast of Thrace. In B.C. 506 Chalcis was conquered by the Athenians, and after the Persian wars the whole island came under their control. After the Peloponnesian War Eubœa became independent, and the island was the scene of intrigues and fighting between the Athenian, Theban, and Macedonian parties, until the battle of Chæronea (B.C. 338) brought it finally under the power of Macedon. Under the Romans it had a nominal independence from B.C. 194 to 146, when it became part of the Province of Macedonia. The conquest of Constantinople by the Crusaders in A.D. 1204 brought the seaports under the rule of the Venetians, and after many petty wars they became masters of the whole island in 1366. It was taken by the Turks in 1470, and remained in their possession until the Greek Revolution. In 1830 it was made part of the new Greek State, of which it now forms a nomarchy. Consult: Baumeister, *Topographische Skizze der Insel Euboia* (Lübeck, 1864); Bursian, *Geographie von Griechenland* (Leipzig, 1868-73).

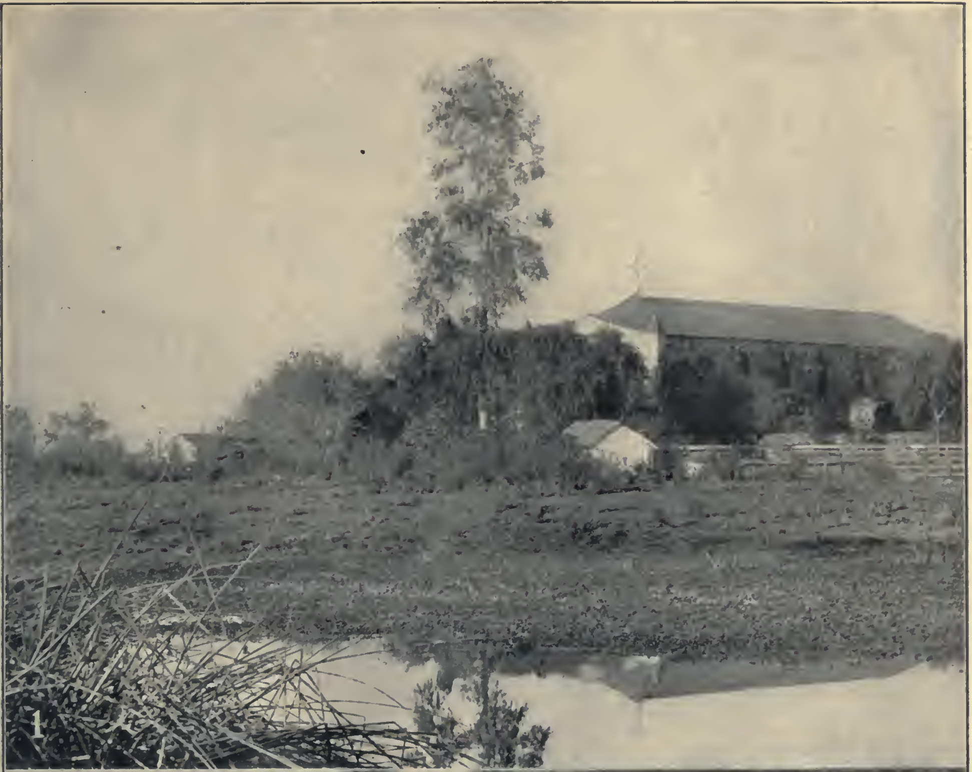
EUBU′LIDES, û-bū′lĭ-dēz (Lat., from Gk. Εὐβουλίδης, *Euboulidēs*), OF MILETUSO. A Greek philosopher of the Megaric school in the fourth century B.C. He is not known to have written anything, but he is credited with the invention of several of the most false and captious syllogisms of his school. He was a strong opponent of Aristotle, whose writings he repeatedly censured, and whose character he calumniated. Demosthenes is said to have studied dialects under him.

EUBU′LUS (Lat., from Gk. Εὔβουλος, *Euboulos*). An Athenian orator and statesman, contemporary of Demosthenes. He was of the peace party in Athens, and became administrator of the city finances, an important position, but of which the exact duties are little known. He was succeeded in this office by Lycurgus, the celebrated financier. Eubulus was the friend of Æschines, and was concerned in all the events of interest during the middle of the fourth century.

EUBULUS. A Greek poet of the Middle Comedy, who flourished about B.C. 375. He is said to have written 104 plays, mainly on mythological subjects, and in simple, elegant language. Some of his works parodied the early tragedies, particularly those of Euripides. Fifty titles and the extant fragments of his plays are collected in Meineke, *Fragmenta Comicorum Græcorum* (Berlin, 1839-57), and in Kock, *Comicorum Atticorum Fragmenta* (Leipzig, 1884).

EU′CALYP′TUS (Neo-Lat., from Gk. εὖ, *eu*, well + καλυπτός, *kalyptos*, covered, from καλύπτειν, *kalyptein*, to cover). A genus of trees and shrubs of the natural order Myrtaceæ, embracing about 150 species, all but four or five of which are natives of Australia and Tasmania only. The few exceptional species are found from the Malay Peninsula southward through the East Indies. The trees are of striking appearance and, with related species of the same family, are quite characteristic of the Australian forests. They have entire, leathery leaves that contain considerable volatile oil. Upon the young shoots of many species the leaves are opposite, and have their upper and lower surfaces disposed as in ordinary plants.

EUCALYPTUS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1. THE BLUE GUM (Eucalyptus globulus) showing its habit when growing alone.

2. AN AVENUE OF EUCALYPTUS TREES.

On the older twigs the leaves are arranged alternately upon the stem; each leaf is unsymmetrical with respect to its median vein, and is so placed on the stem as to present its edge toward the sun, a protective device to prevent excessive transpiration in the hot climate in which the trees abound. Eucalyptus trees are among the most valuable plants of the Australian forests. Their timber is so varied as to meet almost every requirement, some kinds surpassing most timbers in their great utility. On some species is noted the occurrence of considerable quantities of manna, a hard, brittle, sweet substance containing a form of sugar known as melitose. Many species yield a kind of kino, an astringent resin, which is used in medicine and various manufactures. Tannin is a product of the bark of others, and from the leaves an oil is distilled that has many pharmaceutical and other uses, while from still others, called 'stringy barks,' are obtained fibres used for cordage, paper manufacture, and thatch for buildings. Eucalyptus trees have attained a more or less deserved reputation for planting in malarial districts. They are rapid growing, and present a large leaf surface through which enormous quantities of water are given off to the air. It is probable that their beneficial action is to be attributed to their drying the soil in this way rather than to any volatile substances given off by the leaves. Whatever their action, these trees have been advantageously introduced into the Roman Campagna, Cape of Good Hope, the lake region of Algiers, and elsewhere, in regions formerly noted for the presence of malaria. The species first planted with this object in view was *Eucalyptus Globulus* (for illustration, see Plate of Edelweiss), but *Eucalyptus robusta* and *Eucalyptus urnigera* are said to be better adapted to this purpose. Among the more conspicuous of the many timber-trees belonging to this genus is the Jarrah wood (*Eucalyptus marginata*). This tree often attains a height of 80 feet without lateral branches, and at that height has a diameter of five feet. The timber is heavy, very hard, and is especially adapted to wharf, ship, and other marine uses, it being rated very highly on account of its resistance to the attacks of the shipworm and other borers. Its immunity is believed to be due to the large amount of astringent resin in the timber, rather than to the hardness of the wood. *Eucalyptus amygdalina* is perhaps the largest, or at least the tallest, tree known. Trees 400 feet tall are reported as rather frequent, and one measured in southeast Australia was 471 feet in height. Another had a diameter of over 20 feet at the base, which was considerably buttressed, 12 feet at 13 feet from the ground, and five feet at a height of 210 feet. The timber of this species is extensively used in carpentry, as it is easily worked and does not warp readily. The tree is of rapid growth; specimens in southern France attained a height of 50 feet in eight years. The blue gum (*Eucalyptus Globulus*) is a tree of rapid growth, attaining a height of 350 feet, and furnishes timber equal to the best oak or ash. It is extensively used for outdoor carpentry, telegraph poles, railway ties, etc. The tree is moderately hardy, thriving well in the south of Europe, in India, California, and Florida. It is less hardy than *Eucalyptus viminalis*, which latter has proved able to withstand the cooler temperatures of California considerably north of Sacramento. Trees of this species at the Chico Forestry Station of California attained a height of 80 feet in less than 12 years, and were a foot in diameter. The leaves of Eucalyptus Globulus are extensively used for the oil they contain. It is obtained by distillation, is a valuable antiseptic, has a peculiar camphor-like odor, and is extensively used in medicine and various arts. The principal constituent of the oil is eucalyptol, which is used as a diuretic, stimulant, and antiseptic, being administered in certain forms of intermittent fevers and in the dressing of wounds. The oil obtained from Eucalyptus oleosa is similar in most of its properties and uses to the oil of cajeput, which is obtained from Melaleuca Leucadendron.

Botany Bay Kino, a secretion of many of the species of Eucalyptus, is used in medicine as a substitute for kino (q.v.). It is a resin having astringent and tonic properties. Eucalyptus resinifera was formerly considered the species which produced this substance, but a number of other species are believed to yield kino in even greater quantity. When the bark is wounded a red sap flows freely and hardens in the air into irregular, inodorous, nearly black masses. It is also found in cavities in the trunks of the trees, is commonly called red gum, and is used as a constituent in lozenges for affections of the throat. In small, thin fragments it is of a ruby-red color. It is said to contain eucalyptin, a substance analogous to tannin. From a single tree as much as 500 pounds of kino may be obtained in a season. Eucalyptus citriodora is frequently grown in pots in hothouses for its lemon-scented leaves. The oil obtained by the distillation of the leaves of this species is used in perfumery.

For extended accounts of the various species of Eucalyptus and their uses, see J. H. Maiden, *Native Useful Plants of Australia*, and *The Descriptive Atlas* of the late Baron F. von Mueller, who has contributed more to the knowledge of Eucalyptus than any other person.

EUCHARIS, ū′kȧ-rĭs. One of Calypso's nymphs, beloved of Telemachus, in Fénelon's romance of *Télémaque*. The character is supposed to be meant for Mademoiselle de Fontanges, a mistress of Louis XIV.

EU′CHARIST. See Lord's Supper.

EUCHLO′RINE (from Gk. *εὖ*, *eu*, well + *χλωρός*, *chlōros*, greenish-yellow). A bright-yellow gas that is generated when potassium chlorate is treated with hydrochloric acid. It was first prepared by Sir Humphry Davy, who believed it to be a new oxide of chlorine, but later investigations have shown it to be a mixture of free chlorine and chlorine peroxide in varying proportions. It is a more powerful oxidizing agent than chlorine itself, and is used for bleaching purposes and as a disinfectant.

EUCHRE, ū′kẽr (apparently from Ger. *Juchs*, joke, from the 'joker' in the pack, from MHG. *juch*, *ju*, an exclamation of joy). A game of cards said to be of German origin, but now very popular in the United States. Usually thirty-two cards are used, the twos, threes, fours, fives, and sixes being rejected, but sometimes sevens and eights are also thrown out. Before the game is started the players cut for deal, ace high dealing, after which the cards are cut by the person at the right of the dealer. Five cards are dealt to each player, by two at a time, and three at a time, or vice versa. The dealer turns up the top of the undealt cards for trumps. In suits not trumps, the cards rank as at whist, from ace down; in the trump suit the knave (termed the right bower) is the highest trump, and the other knave of the same color, either black or red (termed the left bower), is the next highest, this card being, of course, omitted from the suit to which it would otherwise belong. The best form of the game is when played by four persons; but two, three, or even more than four persons may play, if the rules be adapted accordingly. In two-handed euchre the non-dealer looks at his hand and decides whether he will play it. If he be satisfied and think he can make three tricks, he 'orders up.' The dealer then discards his lowest and least useful card, and takes the trump card into his hand; in this case, however, the dealer must succeed in taking three tricks, or he is 'euchred,' and his opponent scores two points. If the non-dealer be not satisfied with his hand, he says 'pass.' The dealer then has the option of taking up the trump as before, or of passing also. If the trump be ordered up or taken up, the play of the hand commences; if both players pass, the dealer places the trump card face upward underneath the pack, called 'turning it down.' The non-dealer has then the privilege of naming the suit which shall be trumps, which must be another than that previously turned up. If he 'make' a trump he must succeed in taking three tricks or he is euchred; but if he pass it again, the dealer has the option of making it. If both pass a second time, the hand is thrown up, and the other player deals. When the card turned up is red, and the trump is made red, it is called 'making it next'; the same with black. If the trump be made a different color from the turn-up, it is called 'crossing the suit.' If the hand be played, the non-dealer leads; the dealer plays to the card led. He must follow suit if able, otherwise he may play any card he pleases. The highest card of the suit led wins the trick; trumps win other suits. The winner of the trick leads to the next. If a player make all five tricks he scores a 'march,' equal to two points; if he make three or four tricks he scores one point. In three-handed euchre the option of playing or passing goes to each in rotation, beginning with the player to the dealer's left. The player who orders up, takes up, or makes the trump, plays against the other two, and if they succeed in euchring him, each of them scores two points. This is often termed 'cut-throat euchre,' because any one of the three players is liable to be opposed by the other two. Four-handed euchre is generally played with partners, who are cut for and sit opposite each other as at whist; if a player have a strong hand he can decide to 'play alone' single-handed against the two adversaries, and his partner cannot object; a player cannot order up his partner's trump unless he plays alone. Should the lone player succeed in making a march he scores four; if he win three or four tricks he scores one; if he fail to win three tricks the opponent scores two. Sometimes, as in railroad euchre, a blank card called 'little joker' or 'the joker' is added, and is the highest card in the pack, the bowers following; sometimes it is agreed upon to allow the player who makes more than five points to carry the surplus (called a lap) to the next game; or to allow a 'lone' player to call for his partner's best card. In French euchre only 24 cards are used, all below the nines being discarded. Another French variety called 'Napoleon' has been very popular in England in the last twenty years. After the deal the players are called upon in rotation to declare how many tricks they can take, the dealer last unless some other player shall have declared he can take the whole five tricks; if he does not, he is euchred; if he does, he collects double chips from each player; if less than five tricks is the highest bid, and he wins the number he declares, he collects single chips from each player.

Progressive Euchre. A popular form of the game, in which a large number of players take part, the players being seated at tables numbered consecutively from one upward to as many as may be necessary. The players being seated, four at each table, the games begin according to the regular four-handed game. No. 1 is the head or king table, and the players seated at this govern the game as far as time is concerned. The signal is given by ringing a bell at the head table. Lone hands only count two points at this table. If there is a tie at any of the other tables, the winner is decided by cutting the cards or dealing another hand. The progression consists of the winners moving from a lower table to the next higher, the losers remaining in their seats. The game continues to revolve in this fashion until the time fixed for the limit of the game. Each player keeps tally of the games won or lost individually. These games are then summed up. To the two who have won the most games the first prize is awarded.

EUCKEN, oik′en, Rudolf Christoph (1846 —). A German philosopher. He was born at Aurich, East Friesland, and studied philology, history, and philosophy at Göttingen. He was professor of philosophy at Basel from 1871 to 1874, and since 1874 has held the same chair in the University of Jena. His works on systematic philosophy and on the history of philosophy are noteworthy. Several of his philosophical works, notably the *Geschichte und Kritik der Grundbegriffe der Gegenwart* (1878; 2d ed. 1893) and *Die Lebensanschauungen der grossen Denker* (1890; 3d ed. 1899), are widely known. Among his articles which have been translated into English are the following: "Liberty in Teaching in the German Universities" (1897); "Are the Germans Still a Nation of Thinkers?" (1898); "Progress of Philosophy in the Nineteenth Century" (1899); "The Finnish Question" (1899); "The Philosophy of Friedrich Froebel" (1900); "The Present Status of Religion in Germany" (1901).

EU′CLASE (from Gk. εὖ, *eu*, well + κλάσις, *klasis*, break, from κλᾶν, *klan*, to break). An aluminium and glucinum silicate that crystallizes in the monoclinic system. It is a transparent, pale-green, sometimes blue, mineral, found chiefly in schistose rocks in Brazil, especially at Villa Rica, and also in the southern Ural. Its great hardness, and its capacity for taking a polish, make it of value as a gem stone, but its rarity prevents its extensive use. It is also called *prismatic emerald*.

EUCLID, ū′klĭd (Gk. Εὐκλείδης, *Eukleidēs*). The most famous of the Greek writers on geometry who flourished at Alexandria. Nothing is known of his life except that Proclus tells us that he lived in the time of Ptolemy I. (who reigned B.C. 306-283). It is probable that the period of his greatest activity was in the neighborhood of B.C. 300. His fame was so great among the Greeks that he was called ὁ στοιχειωτής, 'the author of the Elements,' and even to-day the name Euclid is synonymous with elementary geometry. His Στοιχεῖα, or 'Elements,' were well known to the Arabs, a portion having been translated in the time of Harun-al-Rashid, a second (complete) translation being made under Al-Mamun and others appearing later. It was translated from Arabic into Latin by Adelard of Bath (c.1120), from a copy obtained in Spain; and this translation, under the name of Giovanni Campano (1260), was printed in 1482 at Venice. Billingsley's translation from the Latin into English appeared in 1570. The extant works unquestionably ascribed to Euclid are the *Elements* (Στοιχεῖα); the *Data* (Δεδομένα); the *Phenomena* (Φαινόμενα); the *Optics* ('Οπτικά); the *Reflections* (Κατοπτρικά); the *Division of the Scale* (Κατατομὴ κάνονος), and a work, *De Divisionibus*, known only through the Arabic. The best editions of Euclid's works are: Peyrard, *Les œuvres d'Euclid en grec, en latin et en français* (Paris, 3 vols., 1814-18); Heiberg and Menge, *Opera Omnia* (Leipzig, 7 vols., 1883-96). One of the best biographies of Euclid is that by De Morgan, in Smith's *Dictionary of Greek and Roman Biography* (under Eucleides). Consult, also: Gow, *History of Greek Mathematics* (Cambridge, 1884), and the authorities referred to under Mathematics.

EUCLID. A native of Megara (fifth or fourth century B.C.), founder of the Megarian School of Philosophy. He was early influenced by the works of Parmenides apparently, from whom he learned not only philosophy, but the art of disputation. The fame of Socrates attracted him to Athens, where he became a devoted follower of the great teacher. He established a school of his own at Megara, the teaching of which was distinguished by its combination of Socratic and Eleatic principles. Euclid held to the unity of Being, as taught by Parmenides (q.v.), with the reality of the intellect (*νοῦς*,) and the moral ideas as set forth by Socrates. This self-identical Being, he taught, is the only reality and constitutes the good; it is not sensuous but intellectual being, i.e. reason, truth, which is for man the *summum bonum*. After Socrates's death (B.C. 399) Plato and other disciples attached themselves for a time to the Megarian School. From Euclid Plato probably got the germs of his doctrine of ideas (*εἴδη*), a technical term, which Euclid first introduced into philosophy. In antiquity six dialogues were current under Euclid's name, but their authenticity was doubted. Nothing has survived. The date of his death is unknown.

Consult: Deychs, *De Megaricorum Doctrina*, etc. (Bonn, 1827); Mallet, *Histoire de l'école de Mégare* (Paris, 1845); Hartenstein, "Ueber die Bedeutung der Megarischen Schule," in his *Historisch-Philosophische Abhandlungen* (Leipzig, 1870); Ritter and Preller, *Historia Philosophiæ Græcæ* (Gotha, 1888); Zeller, *Philosophie der Griechen*, ii. (Leipzig, 1889); Ueberweg, *History of Philosophy*, trans. ed., vol. i. (New York, 1872).

EUDÆ'MONISM (Gk. *εὐδαιμονισμός*, *eudaimonismos*, thinking one happy, from *εὖ*, *eu*, well + *δαίμων*, *daimōn*, genius, spirit). The Aristotelian view that the chief end of human life is happiness, and that happiness is not pleasure, but an activity desirable not as a means to some further end, but for its own sake. What this activity is, is discoverable, according to Aristotle, by ascertaining what the distinctive function of man is. The distinctive function of man is an activity of the soul in accordance with reason. Hence human happiness is the activity of soul in accordance with virtue, virtue being the mean between excess and defect as determined by reason. Pleasure is an essential element in such a life, for "pleasure and life are yoked together and do not admit of separation, as pleasure is impossible without activity and activity is perfected by pleasure." See Energism.

EUDE'MUS (Lat., from Gk. Εὔδημος) of Rhodes. A Greek philosopher. He was a disciple and friend of Aristotle. He composed a number of works defending the doctrine of his master, and is probably the author of the *Eudemian Ethics*, published with Aristotle's writings, and in large part a reproduction of Aristotle's own work, the so-called *Nicomachean Ethics*. Eudemus also wrote, among other books, a history of mathematics and astronomy, which, however, is not extant. A summary of it appears, however, in a commentary on Euclid written by Proclus (c. 410-85), and numerous extracts are found in the work of later writers. Spengel collected the fragments of these works that still exist (1866, 2d ed. 1870). Mullach also published them in his *Fragmenta Philosophorum Græcorum* (vol. iii., 1881). Consult also Gow, *History of Greek Mathematics* (Cambridge, 1884).

EUDES, ēd (also called Eudon, Eudo, and Odo). Duke of Aquitaine, belonging to the close of the seventh century and the beginning of the eighth. He was independent ruler of southern France from the river Loire to the Pyrenees. In 721 he signally defeated the Arabs, who, under the leadership of Es-Samah, had invaded his dominions and besieged his capital of Toulouse. A treaty with Austrasia was broken in 731, and forthwith Charles Martel, the famous Austrasian *maire du palais*, began to harass the northern portion of Aquitaine. At this juncture the Arabs, commanded by Abd-er-Rahman, reinvaded France. Eudes was obliged to request the help of Charles, and a joint army, directed by the latter, won the decisive victory of Tours (732, known in French history as the battle of Poitiers). Consult Vic and Vaissete, *Histoire générale de Languedoc*, vol. i. (5 vols., 1730-45).

EUDES, ēd, Jean (1601-80). The founder of the Roman Catholic congregation of the Eudists. He was born at Mezeray, Normandy, France, November 14, 1601; educated at the Jesuit College at Caen; entered the Congregation of the Oratory in Paris, 1623; was ordained priest 1626; rose to be the superior of the Oratory at Caen, 1639, and then founded in 1643 the Congregation of the Mission Priests of Jesus and Mary for the purpose of giving instruction to priests in practical and missionary work. The members are called, commonly, Eudists. They resemble the Oratorians in that they are all priests, take no vows, and are at liberty to leave the Congregation when they please. They are under episcopal jurisdiction. Their rule was approved by the Pope in 1674. They met the rivalry and jealousy of the Oratorians, and the more since the latter were more or less affected by Jansenism, which the Eudists resisted. Seminaries were opened in various places before the death of Eudes at Caen, August 19, 1680. The Congregation was in great favor under Louis XVI., but fell in the confusion of the time and was dissolved in 1794. In 1826 it was reorganized and is now flourishing in France. In 1641 Eudes founded the Order of 'Daughters of Our Lady of Charity of the Refuge,' for the rescue and restoration of fallen women, which under slightly different names still exists. Consult Montzey, *Le Père Eudes et ses Instituts* (Paris, 1869).

EU'DIOM'ETER (from Gk. εὔδιος, *eudios*, clear weather + μέτρον, *metron*, measure). A graduated glass tube used in the analysis of gases. Joseph Priestley used such an apparatus to determine the quantity of oxygen in atmospheric air; and hence the name, which signifies *measure of purity*. A eudiometer may be either straight, U or V shaped. Near its sealed end it is provided with platinum electrodes fused into the glass; by means of these, gases may be caused to combine in the tube under the influence of electric sparks, and then the change of volume caused by the reaction is directly shown by the eudiometer.

EUDO'CIA (Lat., from Gk. Εὐδοκία, *Eudokia*). The name of several Byzantine princesses, of whom the most important was the wife of the Emperor Theodosius II. She was born about 393, the daughter of the sophist Leontius, or Leon, and was educated by her father. Her accomplishments and her singular beauty were reckoned by Leontius a sufficient fortune, for at his death he left all his property to her two brothers. Eudocia appealed to the Emperor at Constantinople. Pulcheria, the sister of Theodosius, was interested in the maiden, and thought she would make a suitable wife for the Emperor. She was married to the Emperor in A.D. 421. For many years, however, Pulcheria ruled in the imperial household and councils, Eudocia, according to Nicephorus, 'submitting to her as mother and Augusta'; but in 447 a quarrel broke out between them in regard to the Eutychian heresy, of which Eudocia had become a supporter. At first Eudocia was triumphant, and Pulcheria was banished; but in a short time the Emperor was reconciled to his sister, and treated Eudocia so sharply that she retired to Jerusalem, where she died A.D. 460-61. Her latter days were spent in works of piety and charity. Through the influence of the famous Symeon Stylites, she was induced to renounce Eutychianism and become an orthodox Catholic Christian. She wrote a poem in heroic verse on the victory obtained by the troops of Theodosius over the Persians, A.D. 421 or 422; a paraphrase of eight books of Scripture; a paraphrase of Daniel and Zechariah; and a poem in three books on the history and martyrdom of Cyprian and Justina. The authorship of *Homero-Centones*, a work composed of verses taken from Homer, and so arranged as to appear a history of the fall of man and of his redemption by Christ, has also (but without sufficient reason) been attributed to her.

EUDOX'IA FEODOROVNA, fâ'ô-dô-rôv'nȧ (1669-1731). A Czarina of Russia. She was the daughter of the Boyar Feodor Lopukhin, and at the age of nineteen was married to Peter the Great, who was at that time seventeen. Her family belonged to the conservative party, and before long this fact operated to effect a rupture between her husband and herself. In 1698 she was imprisoned in the Convent of Susdal, where she is said to have carried on an *affaire d'amour* with Major Glieboff. On the occasion of the trial of her son Alexis, she was brought to Moscow (1718), and upon his condemnation she was transferred to the Monastery of Staraya Lodoga near Schlüsselburg. In 1728 the accession to the throne of her grandson, Peter II., enabled her to return to Moscow, where she died.

EUDOX'US (Lat., from Gk. Εὔδοξος, *Eudoxos*) (c.408-355 B.C.). One of the most prominent of the Greek mathematicians. He was born in Cnidus, was a pupil of Archytas, who was head of the Pythagorean School at Tarentum, and studied for a few months under Plato. He founded a school at Cyzicus. Diogenes Laërtius speaks of him as an astronomer, physician, legislator, and geometer. It is thought that Euclid v., and xiii., 1-5, dealing with proportion and the five regular polyhedra, is largely due to him. He is said to have invented a curve called the ἱπποπέδη, (horse-fetter), like an 8 on its side.

EUFAU'LA. A city in Barbour County, Ala., 80 miles southeast of Montgomery; on the Chattahoochie River, and on the Central of Georgia Railroad (Map: Alabama, D 4). It is a shipping point of some importance, and has manufactures of cotton goods, cottonseed oil, and fertilizers. The Union Female College, opened in 1854, is located here. Eufaula is governed under a revised charter of 1886, which provides for a mayor, elected biennally, and a unicameral city council of which the executive is a member. The water-works are owned and operated by the city. Population, in 1890, 4394; in 1900, 4532.

EUGA'NEAN HILLS (named after the ancient Italic tribe of *Euganei*). A range of hills in the western part of the Province of Padua, near Padua, Italy (Map: Italy, F 2). They are of volcanic formation and quite isolated. The highest point, Monte Venda, has an altitude of over 1900 feet. The range contains a number of mineral springs and valuable stone-quarries.

EUGEN, oi-gān', FRIEDRICH KARL, Duke of Württemberg (1788-1857). A Russian general, born at Oels, Germany He was a nephew of the Emperor Paul of Russia, and at an early age entered the Russian service. At the age of seventeen he was advanced to the rank of major-general. He was made lieutenant-general at the battle of Smolensk (August 17, 1812), and distinguished himself in the engagements at Borodino, Tarutino, Krasnoi, Lützen, Bautzen, Kulm, and Leipzig. He was commander of the Seventh Russian Army Corps during the Russo-Turkish war of 1828, and permanently resigned from the service after the peace of Adrianople. His principal works are: *Erinnerungen aus dem Feldzuge des Jahres 1812 in Russland* (1846); and *Memoiren* (1862), a volume of interesting recollections.

EUGENE, û-jēn'. A city and the county-seat of Lane County, Ore., 124 miles south of Portland; at the head of steam navigation on the

Willamette River, and on the Southern Pacific Railroad (Map: Oregon, B 5). The State University, opened in 1876, is situated here. The city is the commercial centre for the fertile agricultural country of the upper Willamette Valley, and has also considerable lumbering, mining, and manufacturing interests, the last being promoted by good water-power. The industrial establishments include flouring, woolen, saw, and planing mills; sash, door, furniture, and excelsior factories; iron-works and machine-shops; tanneries, brick-yards, etc. Under a charter of 1893 the government is vested in a mayor, elected bienially, and a municipal council. Eugene was first settled in 1854, and was incorporated ten years later. Population, in 1900, 3236.

EUGÈNE, ẽ′zhân′, FRANÇOIS (1663-1736). A celebrated Austrian general, best known as Prince Eugène of Savoy, his full name being François-Eugène de Savoie-Carignan. He was the son of Eugène Maurice, Count of Soissons and of Olympia Mancini, a niece of Cardinal Mazarin and was born in Paris, October 18, 1663. The banishment of his mother to the Low Countries, by the order of Louis XIV., and the refusal of the King to grant him a commission in the army, so incensed Eugène against France that he indignantly renounced his country, and entered the service of the Emperor Leopold I. as a volunteer against the Turks. Though barely twenty years of age, and without military training, he displayed extraordinary talents in war, especially at the famous siege of Vienna in 1683. He soon rose to a high position in the army. In the war of the Coalition against Louis XIV. (1689-97) he took an active part in the fighting in Italy, and in 1691 was raised to the command of the Imperial army in Piedmont. It was about this time that Louis XIV. offered him the bâton of a marshal of France, the generalship of Champagne, and a large pension, but Eugène refused all such advances. In 1693 he was made a field-marshal of Austria, and on his return to Vienna he was placed at the head of the army of Hungary, and defeated the Turks, with immense slaughter, in the famous battle of Zenta, September 11, 1697. In 1701 the War of the Spanish Succession broke out and Eugène was put in command of the army in Italy; but his forces were too small for him to accomplish anything of importance. In the year 1703, being appointed president of the council of war, he became thenceforth the prime mover of every military undertaking. He first took the command of the Imperial army in Germany, and with Marlborough gained a brilliant victory at Blenheim, August 13, 1704, over the French and Bavarians. Eugène afterwards saved Turin, and expelled the French from Italy in the year 1706. He shared, too, with Marlborough the glory of the fields of Oudenarde in 1708 and Malplaquet in 1709; but being crippled in his resources by the retirement of Holland and England from the contest, he was unable to withstand the enemy on the Rhine. The defeat of his Dutch allies by Villars at Denain, July 24, 1712, was followed by other disasters, until the Peace of Rastadt (1714) put an end to the war.

In 1716, on the renewal of the war against the Turks, Eugène defeated an army of 180,000 men at Peterwardein, took Temesvár, and in the year 1717, after a bloody battle, gained possession of Belgrade. After the Peace of Passarowitz, which was concluded in the following year, he returned to Vienna, where, during the succeeding years of peace, he labored with unwearied energies in the Cabinet. When the question of the succession to the throne of Poland brought on a new war with France (1733-35), Eugène appeared again on the Rhine; but being now advanced in years and destitute of sufficient resources, he was unable to accomplish anything of importance. After the peace he returned to Vienna, where he died April 21, 1736, leaving an immense fortune to his niece, the Princess Victoria of Savoy. In his later years he was a patron of art and literature. Among the common people of Germany and Austria his fame lives in songs, as "Prinz Eugen der edle Ritter"; his reputation as one of the greatest military leaders of his own or, in fact, of any time, is firmly established.

BIBLIOGRAPHY. The most elaborate work on Prince Eugène is that of Arneth, *Prinz Eugen von Savoyen* (Vienna, 1858); for a popular biography, consult Malleson, *Prince Eugene of Savoy* (London, 1888). Other important works are Kausler, *Das Leben des Prinzen Eugen von Savoyen*, etc. (Freiburg, 1838-39); Von Sybel, *Prinz Eugen von Savoyen* (Munich, 1861); Heller, *Militarische Korrespondenz des Prinzen Eugen von Savoyen*, etc. (Vienna, 1848).

EUGENE ARAM, ů-jēn′ ā′ram. A novel by Bulwer Lytton, published in 1832. See ARAM, EUGENE.

EUGE′NIA. See CLOVES; MYRTACEÆ.

EUGENIE, ū-jē′nė, Sir DAUPHINE. The nephew of Morose, in Jonson's *Epicœne.* His love of fun and desire for an inheritance led him to marry his irritable uncle to 'the silent woman,' who is, in reality, a boy in disguise, and bereft, until after the ceremony, of the powers of speech.

EUGÉNIE GRANDET, ẽ′zhå′nẽ′ gräN′då′. A famous novel by Balzac, published in 1834, and descriptive of the evil consequences of avarice, as shown in the unhappy life of the young girl who is the title-character of the story.

EUGÉNIE-MARIE DE MONTIJO, må′rẽ′ de môn-tē′hō (1826—). Ex-Empress of the French. She was born at Granada, in Spain, May 5, 1826, the second daughter of the Count of Montijo and of Maria Manuela Kirkpatrick. In her youth Eugénie bore the title of Countess of Teba, one of the numerous titles of the family of Montijo, and was renowned for her beauty and charm of manner. In 1851 she appeared in Paris, where she aroused the admiration of Louis Napoleon, who married her on January 30, 1853, at Nôtre Dame, soon after being proclaimed Emperor of the French. A son, the Prince Imperial, was born in 1856. In 1859 Eugénie filled the office of Regent during Napoleon's absence with the army in Italy, but showed herself deficient in political ability. She favored the unfortunate Mexican expedition of Maximilian, and in the eyes of many historians she was one of the chief causes of the downfall of the Second Empire. She was a second time Regent, in 1865, on the occasion of Napoleon's journey to Algeria, and she encouraged the Emperor in his ill-advised Roman policy as well as in his opposition to Prussia. During the Franco-German war she was Regent once more, but had to flee to England after the Emperor became a captive, September 2, 1870. She resided at Camden House.

Chiselhurst, England, until 1880. She became a widow January 9, 1873. Her only son, the Prince Imperial, completed his military education in England and was killed in 1879, while serving as a volunteer in the Zulu War. The Empress made a pilgrimage to the scene of his death and afterwards showed little or no interest in politics. She continued to reside mainly in England. Eugénie has been the subject of numerous biographies and memoirs, among them being those of De Lano, *The Empress Eugénie* (London, 1894); Bouchat, *Les élégances du second empire* (Paris, 1896); Saint Armand, *Louis Napoleon and Mlle. de Montijo*, Eng. trans. by E. G. Martin (New York, 1897); Tschudi, *Eugénie, Empress of the French*, a popular biography, translated from the Norwegian by E. M. Cope (London, 1899). Consult also her autobiographical work, *Some Recollections from My Life* (London, 1885).

EUGE′NIUS. The name of four popes. (1) EUGENIUS I. Pope from 654 to 657. He was elected from the Roman clergy in a time of strife between the East and the West over questions of doctrine, and showed a spirit of compromise. He is described as charitable and gentle, and reckoned as a saint. (2) EUGENIUS II. A Roman Pope from 824 to 827. The important event of his pontificate was the adoption of the *Constitutio Romana* (824), which provided that the choice of Pope should be taken from the common people and given to the clergy and nobles, his consecration, however, to be dependent on confirmation by the Emperor and an oath of homage from the newly chosen pontiff. (3) EUGENIUS III. Pope from 1145 to 1153. He was a scholar of Bernard of Clairvaux. During his pontificate occurred the Second Crusade (1147-1149), which he proclaimed and Bernard preached. He was three times expelled from Rome by the Republican party of Arnold of Brescia. (4) EUGENIUS IV. A Venetian, Pope from 1431 to 1447. His pontificate was a season of discord, owing to the proceedings of the Council of Basel and the attacks of enemies at Rome. The Council of Basel was convoked by his predecessor, Martin V., and showed a strong tendency to insubordination. In 1434 Eugenius was compelled to flee from Rome, and remained a refugee at Florence till 1443. In 1436 he attempted to dissolve the council, and in 1438 opened a new council at Ferrara and issued a bull of excommunication against the bishops assembled at Basel. The latter deposed him and set up an antipope, Felix V. (1439). Eugenius died at Rome, February 23, 1447, and Felix yielded in favor of Nicholas V. At the Council of Florence, which succeeded that of Ferrara (q.v.), and at which the Greek Emperor, John Paleologus II., and upward of twenty Greek bishops were present, a union was proclaimed between the Latin and Greek churches (July, 1439). The efforts of Eugenius also met with some success in effecting a temporary reconciliation with certain other Eastern churches. See BASEL, COUNCIL OF; and FERRARA, COUNCIL OF.

EUGIP′PIUS, or **EUGYPPIUS** (c.450-?). An Italian monk, abbot of Lucullanum, near Naples. He was born at Carthage, and after studying at Rome became the pupil of Saint Severin, at Fariana, in Noricum. He wrote *Vita Sancti Severini* (A.D. 511), an important contribution to the Church history of Germany, and compiled *Thesaurus Augustinianeus*, a collection of excerpts from the works of Saint Augustine. There is a monastic rule which is ascribed to Eugippius, but it was superseded by that of Saint Benedict. Consult the edition of the former work by Knoell, vol. ix. of the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1885-86).

EUGNATHUS, ûg-nā′thŭs (Neo-Lat., from Gk. εὖ, *eu*, well + γνάθος, *gnathos*, jaw). One of the precursors of the mudfish (*Amia*), fossil remains of which have been found in the Liassic rocks of England and the Jurassic rocks of Bavaria. The body was elongated, and covered with ganoid scales, which were strengthened on their inside surfaces with vertical ribs, and many of which were fastened to each other by peg-and-socket joints. There is a dorsal fin, a pair each of pectoral and pelvic fins, an anal fin, and a semi-heterocercal tail-fin.

EU′GUBINE TABLES (Lat., *Tabulæ Eugubinæ*). The name given to seven bronze tablets, the inscriptions on which present a comprehensive and very remarkable memorial of the Umbrian language. They were discovered in 1444 at Gubbio (the ancient Iguvium or Eugubium), where they are still preserved. The characters on four of the tablets are Umbrian, on two Latin, and on one partly Latin and partly Umbrian. The language resembles somewhat the older forms of the latter, and also the Oscan dialects. The subjects of the inscriptions are directions concerning sacrificial usages and forms of prayer, and they seem to belong to two periods; those in Umbrian characters to the second century B.C., and those in Latin letters to the time of Sulla. Philip Buonarotti first published them in a complete form in Dempster's *Etruria Regalis* (Florence, 1723-24). The real decipherment of the inscriptions was due to Karl Ottfried Müller and Grotefend, and the final corrections and improvements were made by Bücheler and Lepsius. The best work on the inscriptions is Bréal, *Les tables eugubines* (Paris, 1875-78). Consult also, Newman, *The Iguvine Tables* (London, 1864), which includes the text with Latin translation and commentary.

EUHEM′ERISM. The name usually applied to the theory which seeks to explain all mythology as distorted history. The name is derived from Euhemerus (Εὐήμερος,) of Messana in Sicily, who was a contemporary and friend of Cassander of Macedon (B.C. 311-298). Sent by the King on a voyage to the south, he utilized his travels to bring his theory before the world. In his *Sacred Record* (Gk. ἱερὰ ἀναγραφή) he described the habits and government found on an island, Panchæa, in the Indian Ocean. This enabled him to set forth his view of an ideal State. He endeavored to show that the Greek gods were merely men, who had been deified because of their power or services to mankind. He was not the first to suggest this interpretation, as it had already been applied to various myths of the heroes connected with early Grecian history by such writers as Hecatæus and Ephorus; but he carried it far beyond any previous writer in the universality of its application even to the gods. Naturally, and probably with full justice, the book brought upon its author the name of Atheist, though, considering its obviously fictitious character, it is hard to see why he should have been branded as a deceiver. Many of the later writers adopted his views, and to many of the early Christian apologists his work was a welcome storehouse of material for use in their attacks upon the heathen divinities. The theory has had defenders from the days of its founder to the present time. In the eighteenth century it was made prominent by Banier's *La mythologie et les fables expliquée par l'histoire* (Paris, 1738), and with some admixture of the allegorizing tendency is found in those writers who endeavored to interpret Greek legends as a derivation from the biblical narrative, as in the *Arca Noœ* of Athanasius Kircher and others—a method which survived long, and is found even in 1893 in the *Revue d'exégese mythologique* of the Abbé Fourier. Some elements of Euhemerism may also be attributed to those theories which see the origin of all mythologies, and even all religious emotions, in the worship of ancestors and spirits of the dead. Consult: Sieroka, *De Euhemero* (Königsberg, 1868); Némethy, *Euhemeri Reliquiœ* (Budapest, 1889); Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, vol. i. (Leipzig, 1891).

EUHEM′ERUS. See EUHEMERISM.

EULACHON, ū′lȧ-kŏn, or **OOL′ACHAN.** See CANDLEFISH.

EULA′LIUS. Antipope chosen in opposition to Boniface I., 418. The dispute occasioned the first interference on the part of the temporal authorities in the choice of a pope. The party of Boniface prevailed, and Eulalius left Rome, and later resigned all pretensions. He died as Bishop of Nepi.

EULENBERG, oi′len-bĕrk, HERMANN (1814—). A German physician. He was born at Mühlheim-on-the-Rhine, and studied at Bonn and Berlin. At Coblenz he founded the publication entitled *Korrespondenzblatt der deutschen Gesellschaft für Psychiatrie und gerichtliche Medizin*, and made investigations in regard to the prevalence of cretinism and goitre in the district of Coblenz (*Beiträge zur pathologischen Anatomie des Kretinismus*, in collaboration with Marfels, 1857). He subsequently became Government counselor and medical counselor at Cologne (1860-70), and was in 1870 appointed counselor to the Ministry of Education (1870-87). From 1870 to 1890 he conducted the *Vierteljahrsschrift für gerichtliche Medizin und öffentliches Sanitätswesen.* His principal works, which deal mainly with public hygiene, are the following: *Das Medizinalwesen in Preussen* (1874); *Handbuch der Gewerbehygiene* (1876); *Handbuch des öffentlichen Gesundheitswesens* (in collaboration with other specialists, 2 vols., 1881-82); and *Schulgesundheitslehre* (with Bach, 2d ed. 1896).

EULENBURG, oi′len-bo͞ork, ALBERT (1840—). A German physician. He was born in Berlin and was educated at the Universities of Berlin and Bonn. As assistant in the University Hospital at Greifswald, he published in 1864 the important treatise entitled *Die hypodermatische Injection der Arzneimittel* (3d ed. 1875), for which he received the prize awarded by the Hufeland Society of Berlin. In 1874 he was appointed professor of therapeutics and director of the Pharmacological Institute at Greifswald. He returned to Berlin in 1882, and devoted himself to researches in neuropathology, on which subject he was soon a recognized authority. Besides publishing the important works respectively entitled *Sexuale Neuropathie* (1895) and *Lehrbuch der Nervenkrankheiten* (2d enlarged ed. 1878), he became editor of the *Real-Encyklopädie der gesamten Heilkunde* (3d ed. 1893 et seq.). He was also editor of the *Encycklopädische Jahrbücher der gesamten Heilkunde* (1891 et seq.), and, in collaboration with J. Schwabe, of the *Deutsche medizinische Wochenschrift.*

EULENBURG, BOTHO, Count (1831—). A German statesman, a son of the Prussian statesman Count Botho Heinrich Eulenburg (1804-79). After studying law and holding a position as Government counselor, he was elected to the North German Reichstag as a Conservative in 1867. In 1878 he was appointed Minister of the Interior, in which capacity he formulated the Socialist law of October, 1878, and vigorously prosecuted the work of administrative reform. Differences arose between him and Bismarck over what the Chancellor thought to be undue leniency, and he was compelled to resign in 1881. After the withdrawal of the Chancellor, Count Caprivi, from the Prussian Premiership in 1892, Eulenburg succeeded to the presidency of the Ministry, and in the same year became Minister of the Interior. But his advocacy of strenuous measures against the social democracy was disapproved by Chancellor Caprivi, and the differences arising between the two men culminated in their resignation from office, October 26, 1894. Eulenburg took his seat in the Prussian House of Lords in 1899.

EULENBURG, FRIEDRICH ALBRECHT, Count (1815-81). A German statesman. He entered the diplomatic service in 1852, and was appointed consul-general at Antwerp. In October, 1859, as head of the Eastern Asiatic Expedition of the Prussian Government, he conducted negotiations leading to commercial and maritime treaties with China and Japan. So admirably did he discharge the extremely difficult mission (the respective treaties with Japan and China being duly ratified on January 24 and September 2, 1861), that, upon his return, he was appointed by Bismarck Minister of the Interior (December 8, 1862). After 1866 he energetically organized the administration of the newly acquired provinces of Prussia, consistently following a conservative policy until 1878, when certain concessions which he had been forced to make to the Liberal party were strenuously opposed by Bismarck, and led to his resignation, March 30, 1878.

EULENBURG, PHILIPP, Prince (1847—). A German diplomat, born at Königsberg, Prussia. He served in the wars with Austria and France, and studied law at Leipzig and Strassburg from 1872 to 1875. He was Prussian Ambassador to Oldenburg from 1888 to 1890, at Stuttgart (1890), Munich (1891), and Vienna (1894). He is interested in literature and music, and has published a number of works, among them *Skaldengesänge* (1892); *Dichtungen* (1892); *Das Weihnachtsbuch* (1892); *Erich und Erika und andere Erzählungen für Kinder* (1893); and *Abenderzählungen, Märchen und Träume* (1894).

EULENSPIEGEL, oi′len-shpē′gel, TILL or TYLL (fourteenth century). A German of clownish wit, whose gross jests made his life the gathering point of popular tales of mischief. A Low Saxon account of his pranks was written in 1483 and printed in 1519 in a High German version, probably by Thomas Murner (q.v.). It has often been edited, best by Lappenberg (1854). It was soon rendered into Czech, Polish, Italian, Danish, French, Latin, and into English under the title *Howle-Glass.* It has been adapted for modern German readers by Simrock (1878). Its universal popularity is a striking witness to the general debased taste that preceded the Reformation. It was afterwards adapted by both Reformers and Catholics to their purposes. Fischart (q.v.) issued a metrical version in 1571. Modern imitations are: Böttger, *Till Eulenspiegel: Modernes Heldengedicht* (1850); and Wolff, *Till Eulenspiegel Redivivus* (1875). A modern English edition, elaborately illustrated, appeared in 1860, and a translation by Mackenzie in 1890. Consult Roscoe, *German Novelists* (London, 1880).

EULER, oi′lẽr, LEONHARD (1707-83). A Swiss mathematician, one of the most remarkable of his century. He was born at Basel. Euler was sent to the University of Basel so early and was so proficient in his work that he received the master's degree at the age of sixteen. He studied mathematics under Johann Bernoulli at Basel, and also studied theology, the Oriental languages, and medicine. In the course of his physiological researches he wrote a treatise on the nature and propagation of sound, and he also wrote an essay on the masting of ships, which received a prize of the French Academy of Sciences in 1727. In that year Euler went to Saint Petersburg upon the invitation of Catharine I., and became an associate of the Academy of Sciences. In 1730 he was made professor of physics, and in 1733 professor of higher mathematics. In 1740 he became inspector of the geographical department, and in the following year was called to Berlin by Frederick II. to take the chair of mathematics in the Academy of Sciences, from which he was not long afterwards advanced to the position of director of the mathematical class. In 1766 he was called back to Saint Petersburg, where he remained until his death. Euler lost one eye as the result of a severe illness in 1735, and soon after his return to Russia in 1766 he lost the use of the other. This did not, however, hinder his mental activity, and he contributed extensively to the science of mathematics until the day of his death.

The number no less than the value of Euler's mathematical writings was very great. He wrote, aside from his separate treatises, 473 memoirs published during his life, 200 published soon after his death, and 61 others of which the publication was undertaken by P. H. and N. Fuss in 1849. Of his more important treatises, the following may be mentioned: *Mechanica sive Motus Scientia Analytice Exposita* (1736; 2d ed. 1742); *Tentamen Novæ Theoriæ Musicæ* (1739); *Einleitung in die Arithmetik* (1742); *Methodus Inveniendi Lineas Curvas Maximi Minimive Proprietate Gaudentes* (1744); *Theoria Motuum Planetarum et Cometarum* (1744; German edition 1781); *Opuscula Varii Argumenti* (3 vols., 1746-51); *Gedanken von den Elementen der Körper* (1746); *Lettres à une princesse d'Allemagne sur quelques sujets de physique et de philosophie* (1768-72; 2d ed. by Cournot, 1842; German edition, Stuttgart, 1853; English edition, New York, 1833). His text-books were relatively less important; they include the following: *Introductio in Analysin Infinitorum* (1748; French edition 1796-97; German edition, 1785-90); *Institutiones Calculi Differentialis* (1755; 2d ed. 1804; German edition 1790-98); *Institutiones Calculi Integralis* (3 vols., 1768-70; 3d ed., 4 vols., 1824-45; German edition, 4 vols., 1828-40); *Anleitung zur Algebra* (1771; 3d ed. 1821; French edition 1770; 2d ed. 1795, and Paris, 1807; American edition 1818, 2d ed. 1821); *Dioptrica* (3 vols., 1769-71); *Theoria Motuum Lunæ Nova Methodo Pertractata* (1772); *Opuscula Analytica* (1783-85). For biography of Euler, consult: Condorcet, *Eloge,* in Euler's *Institutiones Calculi Differentialis,* and in his *Lettres à une princesse d'Allemagne;* also Fuss, *Correspondance mathématique et physique* (Saint Petersburg, 1843).

EUMÆ′US (Lat., from Gk. Εὔμαιος, *Eumaios*). The faithful swineherd in the *Odyssey,* who recognizes Odysseus on his return and aids him in destroying the suitors.

EUMENES, ū′mḗ-nēz (Lat., from Gk. Εὐμένης) (c.360-316 B.C.). A capable general of Alexander the Great, born at Cardia, in Thrace. He was private secretary of Philip of Macedon, and, after Philip's death, of Alexander, under whom he was also commander of the cavalry. On the death of Alexander, Eumenes became Governor of Cappadocia, Paphlagonia, and the seacoast of Pontus as far as Trapezus. With Perdiccas as an ally, he defeated Craterus, Neoptolemus, and Antipater in B.C. 321. In the next year he was himself defeated by Antigonus, and retreated to Nora, on the borders of Lycaonia and Cappadocia, where he withstood a long blockade (B.C. 320-319). He was finally betrayed into the hands of Antigonus, by whose orders he was put to death (B.C. 316). With the death of Eumenes there came to an end the last effort to hold together the Macedonian Empire for the rightful heirs of Alexander the Great.

EUMENES II. (?-B.C. 159). King of Pergamum, and a son of Attalus I. He began his reign in B.C. 197 and was a faithful ally of the Romans in their war against Antiochus the Great. He contributed largely to the victory at Magnesia (B.C. 190) and received, in recognition of his services, the provinces of Mysia, Lydia, and Phrygia; so that he became one of the most powerful rulers in Asia. By his political sagacity in continuing friendly to Rome, he greatly increased the political prestige of his realm, and his rule was marked by peace and prosperity. He was a liberal patron of the arts and sciences, and attracted many scholars to his Court. He completed the magnificent altar at Pergamum, and established a library which is said to have rivaled that of Alexandria. He ruled until B.C. 159, and was succeeded by his brother, Attalus II.

EUMENIDES, û-mĕn′ĭ-dēz (Lat., from Gk. Εὐμενίδες, the gracious ones, from εὖ, *eu*, well + μένος, *menos*, mind). The euphemistic name of the Erinyes. Their Latin name was *furiæ* or *diræ.* Mentioned by the earliest poets, they play a prominent part in the writings of the tragedians. They are representatives of the mighty powers who punish those who offend against the unwritten laws of conduct. Their home is in the lower world, but their power extends into this life, and they hunt the sinner to his ruin. In the epic they punish perjury, homicide, and such sins in the household as neglect of parents and ill-treatment of guests. In the tragedies there are indications of a more general conception of them as guardians of the universal laws. They either take vengeance on the living, or carry off the sinner to the lower world, where others can punish him. They are also the torturers of sinners in the other world. As pursuers of criminals they are represented in the short tunic and boots of the huntress or accompanied by hounds; as avengers they bear whips or burning torches; while the snake of chthonic divinities appears in their hair or carried in their hands. At first their number is not mentioned; Homer once uses the singular, and a Demeter Erinys was worshiped at Thelpusa in Arcadia. Æschylus brought fifteen on the stage in the *Eumenides*, but in Euripides the number is three, and later learning gave them the names Alecto, Megæra, Tisiphone. Their genealogy also was uncertain. Hesiod calls them daughters of Gæa, and Æschylus of Night. Such dread deities, however, are terrible only to the sinner; to the devout worshiper they are bringers of blessing and protection, and hence are truly called Eumenides, or at Athens Σεμναί = revered. They were honored at Sicyon, Argos, and elsewhere, but we are best informed about Athens, where they had a sanctuary near a cave on the east side of the Areopagus, and a sacred inclosure at Colonus. Consult: Æschylus, *Eumenides;* and Sophocles, *Œdipus at Colonus.*

EUMOL'PUS (Lat., from Gk. Εὔμολπος, *Eumolpos*, the sweet singer, from εὖ, *eu*, well + μολπή, *molpē*, song, from μέλπειν, *melpein*, to sing). In the later mythology of Greece, the son of Poseidon and Chione, daughter of Boreas and Oreithyia. He was brought up in Ethiopia, whence he went to Thrace, and afterwards passed into Attica at the head of a body of Thracians, to assist the Eleusinians in their war against Erechtheus, King of Athens. Eumolpus fell in the battle, and later the Eleusinians submitted to the Athenians, only reserving the celebration of the mysteries in their own hands. Eumolpus also appears as King of Eleusis, and it is to him that the Demeter communicates the mysteries. To him the hereditary priests of the goddess at Eleusis, the *Eumolpidæ*, traced their descent. Other legends connected him with the mythical Thracian bard, Musæus, either as pupil, son, or even father. To endeavor to harmonize the many contradictory stories about Eumolpus, some of the later mythographers distinguished three persons of this name.

EUNA'PIUS (Lat., from Gk. Εὐνάπιος) (c.346-?). A Greek sophist, born at Sardis. He was a Neoplatonist, a believer in the old religion and a bitter enemy of Christianity. In his youth he was a pupil of the Neoplatonist Chrysanthius, and from A.D. 362 to 366 he was a student at Athens, in the school of Prohæresius. In the latter year he returned to his native town and there set up a school for himself. His death occurred not earlier than A.D. 414. He wrote at the beginning of the fifth century a work entitled *Lives of the Philosophers and Sophists*, containing twenty-three biographies of representative Neoplatonists and Sophists; edited by Boissonade (Paris, 1849). This work is preserved. He was also the author of a contemporary history in forty books, designed to be a continuation of the history of Dexippus. It included the years from A.D. 270 to 404. We have only fragments of this history, but its substance is incorporated in the work of Zosimus.

EU'NICE (Lat., from Gk. Εὐνίκη, *Eunikē*). A Jewess of Lystra, mentioned in the New Testament (Acts xvi. 1; II. Tim. i. 5) as the mother of Timothy. Her husband was a Greek (Acts xvi. 1), in deference to whom probably she allowed their son to remain uncircumcised (Acts xvi. 3). But she had given him a religious name (*Timotheus*—honoring God) and had faithfully trained him from early years in the Jewish Scriptures (II. Tim. iii. 15). As she is referred to at the beginning of Paul's second missionary tour as a believer, it is likely that she was one of the converts of his first missionary work. See TIMOTHY.

EUNO'MIUS (Lat., from Gk. Εὐνόμιος) (?-c.392). The founder of the once numerous Arian sect of Eunomians, which disappeared in the fifth century. He was born in the village of Dacora, in Cappadocia, and was first a lawyer, then a soldier, and ultimately took holy orders. In 360 he was appointed Bishop of Cyzicus, and held his see till 364. In the great controversy regarding the nature of the Trinity which raged during the fourth century, Eunomius was conspicuous by his advocacy of the extreme Arian view that the Father alone was eternal and supreme; that the Son was generated of Him; and the Holy Spirit, again, of the Son. His doctrine of the Trinity is sometimes called the *anomoian*, 'dissimilar,' to distinguish it, on the one hand, from the *homoiousian*, 'similar,' held by the semi-Arians, and, on the other, from the *homoousian*, 'identical,' held by the Athanasian or Trinitarian party. (See HOMOOUSION.) His life was much checkered. He was banished from one place to another, until at length he obtained permission to retire to his native village, where he died about 392. His writings are preserved only as fragments here and there in the works of his adversaries. Consult Klose, *Geschichte und Lehre des Eunomius* (Kiel, 1833).

EUNUCH (Lat. *eunuchus*, Gk. εὐνοῦχος, from εὐνή, *eunē*, bed + ἔχειν, *echein*, to have). In general, a castrated man; specifically, such a man employed as keeper of a harem or in a priestly capacity. Eunuchism is of prehistoric origin, and prevails in some form or other among nearly all races and peoples. In earlier stages of culture, reproduction is regarded as one of the deepest of mysteries, and various beliefs and customs gather about the several processes, all grading into phallicism with recognition of the masculine element; and the more striking comprise introcision (or artificial hypospadia) among the Australian natives, circumcision among various peoples, castration chiefly in Asia and Northern Africa, and non-instrumental devirilization (commonly miscalled hermaphroditism) among American Indian and other tribes. Primarily the customs were religious, or at least fiducial, and ritualistic; and, with the possible exception of circumcision, they are all symbolic of feminization and hence of reproduction, though this motive is largely obscured in the moderately advanced culture in which eunuchism prevails. The so-called hermaphrodites of the Western Hemisphere are usually regarded as prostitutes, and they sometimes become protectors or keepers of the women of the tribe in the absence of the warriors or hunters. Vestiges of precisely similar functions are found among the actual eunuchs of the Eastern Hemisphere. See Sophiology.

EUNUCHUS, û-nŭk′ŭs (Lat., Eunuch). One of the brightest and most successful comedies of Terence, derived from the *Eunuchus* and the *Kolax* of Menander. It was produced in B.C. 161. It suggested Sir Charles Sedley's *Bellamira*, Brueys's *Le Muet*, and La Fontaine's *L'Eunuque*.

EUOM′PHALUS. A fossil gastropod with wide, depressed, spiral shell. Many species are known from rocks of Silurian to Triassic age, but they are most common in those of the Carboniferous period, especially in Europe. Allied genera of importance are Ophileta and Maclurea (qq.v.) of Ordovician age.

EUON′YMUS. See Spindle-Tree.

EUOR′NITHES (Neo-Lat. nom. pl., from Gk. *εὖ*, *eu*, well + *ὄρνις*, *ornis*, bird). A prime division of birds, embracing all except the Archæopteryx (q.v.), which is hence regarded as a representative of another and very different ancient structural type of birds, the Archæornithes. Equivalent terms are Neornithes and Eurhipiduræ, the latter meaning 'fan-tailed' (euornithic) as opposed to the arch-ornithic Saururæ, or 'lizard-tailed' type.

EU′PATO′RIA. A seaport and district town in the Russian Government of Taurida, situated on the western coast of the Crimea, 38 miles northwest of Simferopol (Map: Russia, D 5). Its harbor, an inlet of the Black Sea, is unprotected, but free from ice the entire year. The city is picturesque in appearance, having an Oriental character. Among its numerous mosques, the most noteworthy is that built by Delvet-Ghiri Khan in 1552, modeled after the Mosque of Saint Sophia in Constantinople. There are a number of Tatar high schools, synagogues, Turkish baths, etc. The town has a number of tanneries, soap and candle factories, and there is a considerable trade in grain, wool, and salt. The salt lake of Saki, on which Eupatoria is situated, is one of the best bathing resorts in the Crimea, and the population of the town is swelled every summer by many visitors. Eupatoria was an important place under the Tatars. With its annexation to Russia in 1784 it received its present name from an old fort constructed during the reign of Mithridates Eupator in the Crimea. A portion of the allied Anglo-French forces effected a landing at Eupatoria on September 14, 1854, and held the town for four days. The town was also the scene of a battle between the Russians and the Turks on February 17, 1855, in which the latter were victorious.

EU′PATO′RIUM (Lat. *eupatoria*, Gk. *ἐυπατόριον*, *eupatorion*, the plant hemp-agrimony; named in honor of Mithridates Eupator). A genus of plants of the natural order Compositæ, having small flower-heads in corymbs, with the florets all tubular. The species, about 400 in number, are mostly American, a few occurring in Europe and Asia. One only is British, the common hemp-agrimony (*Eupatorium cannabinum*), a slightly aromatic perennial plant, growing mostly in marshy places and on the banks of streams. The root was formerly employed as a purgative, and the plant was also used as a diuretic and as a vulnerary. Thoroughwort, or boneset (*Eupatorium perfoliatum*), a species having the opposite leaves joined at the base, is very common in low grounds in North America, and is a popular medicine often administered in intermittent fevers, also as an emetic and purgative, and, in small doses, as a tonic. It contains eupatorin (a bitter glucoside), a volatile oil, tannin, etc. The whole plant is very bitter. Other North American species possess similar properties, and the root of one, known as gravel-root, or joe-pye weed (*Eupatorium purpureum*), is employed as a diuretic for the relief of the disease from which it derives its name. The ayapana (*Eupatorium triplinerve*), a half-shrubby species, native of the north of Brazil, has a high reputation in that country as a cure for snake-bites, and has been introduced into the East Indies. It is a very powerful sudorific, and is also diuretic. The Peruvian vulnerary, matico, has been referred, but uncertainly, to a shrubby species of this genus (*Eupatorium glutinosum*). Guaco, or huaco, much valued in Peru as a cure for snake-bites, is supposed to belong to the allied genus Mikania. For illustration, see Plate of Boneset.

EUPAT′RIDÆ (Lat., from Gk. *εὐπατρίδαι*, *eupatridai*, nom. pl. of *εὐπατρίδης*, *eupatridēs*, having a noble father, from *εὖ*, *eu*, well + *πατήρ*, *patēr*, father). The old aristocracy of birth in Athens. They held the full citizenship, and had exclusive political rights and priestly functions, of which they were deprived by the Constitution of Solon. Their influence was, however, long preserved by their territorial possessions.

EUPEN, oi′pen. A town of the Prussian Rhine Province, situated in a beautiful valley, within two miles of the Belgian frontier, and about 10 miles south of Aix-la-Chapelle (Map: Prussia, B 3). Eupen is known for its extensive woolen mills, and, in addition, it has iron-foundries, tanneries, dye-works, and breweries. Population, in 1890, 15,445; in 1900, 14,294.

EU′PHEMISM (Gk. *εὐφημισμός*, *euphēmismos*, from *εὐφημίζειν*, *euphēmizein*, to speak auspiciously, from *εὔφημος*, *euphēmos*, auspicious, from *εὖ*, *eu*, well + *φήμη*, *phēmē*, voice, from *φάναι*, *phanai*, to speak). A figure of rhetoric by which an unpleasant or offensive matter is designated in indirect and milder terms. Thus, instead of directly calling up an unpleasant image by the word *died*, we say, "He was gathered to his fathers," and the elves and fairies of modern superstition are spoken of as 'good neighbors.' Dickens and others have employed euphemisms for comic effect.

EU′PHOBE′RIA. See Myriapoda, Fossil.

EU′PHOR′BIA. See Spurge; Euphorbiaceæ.

EU′PHOR′BIA′CEÆ (Neo-Lat. nom. pl., from Lat. *euphorbeum*, *euphorbea*, Gk. *εὐφόρβιον*, *euphorbion*, the plant spurge; named in honor of Euphorbus, a celebrated Greek physician at the Mauretanian Court). A very extensive order of dicotyledonous plants, the 'spurge family,' containing 220 genera and upward of 4000 species—trees, shrubs, and herbaceous plants. They abound chiefly in warm countries, and most of all in tropical America. The few species found in the colder parts of the world are all herbaceous. The common box reaches a more northern limit than any other shrubby species. The species common to the United States are different kinds of spurge (Euphorbia), croton, three-seeded mercury, spurge-nettle, and queen's-delight (q.v.). The Euphorbiaceæ usually abound in an acrid and poisonous milky juice, although there are species of which the juice is bland, or becomes bland through the application of heat, so that their leaves may be used as food. The leaves in this order exhibit great diversities. The inflorescence is also various. Nearly every type of inflorescence is found in this order. The flowers are always unisexual, and may be monœcious or diœcious. In some species the perianth consists of one or two whorls, in others it is wholly absent; when present, it is usually five-parted. The stamens are one to many and variously united. The ovary is usually three-lobed, the carpels splitting elastically and throwing the seed to some distance. This is shown well in the drying of castor-beans. Among those remarkable for the acridity of their juice are the manchineel (q.v.) and *Excœcaria Agallocha*, an East Indian tree, formerly supposed to yield one of the kinds of aloes-wood, the smoke from the burning of which is extremely irritating to the eyes. The juice of many of the spurges is also very acrid. Many of the Euphorbiaceæ are valued for their medicinal properties, different parts of the plant being in some instances employed, and in some the resin and oils which they contain. Many of the Euphorbiaceæ yield valuable products—rubber, cassava, castor oil, croton oil, euphorbia oil, candlenut, cascarilla, African teak, etc. (See Hevea; Manihot.) Others, such as Croton and Codiæums, are often cultivated in gardens and hothouses, more frequently for their curious appearance than for their beauty; but the large scarlet bracts of Euphorbia pulcherrima, a native of Mexico, are very attractive. The principal genera are Phyllanthus, Croton, Mercurialis, Acalypha, Ricinus, Dalechampia, Hevea, Jatropha, Manihot, Codiæum, Stillingia, Hura. Euphorbia, Poranthera, and Ricinocarpus. See Plate of Edelweiss.

EUPHOR′BIUM. A gum resin. See Gums.

EUPHOR′BUS (Lat., from Gk. Εὔφορβος). One of the bravest of the Trojan warriors, the son of Panthoüs and Phrontis. He first wounded Patroclus when the latter was fighting in the armor of Achilles, and was slain by Menelaus.

EUPHO′RION (Lat., from Gk. Εὐφορίων), (276-c.200 B.C.). A Greek poet and grammarian. He was born at Chalcis, in Eubœa, but studied at Athens, and became librarian to Antiochus the Great about B.C. 220. His works, which included historical and grammatical productions in prose, epics, elegies, and epigrams, were censured by Cicero as affectedly obscure. Among the Romans of the Augustan period, however, he was very popular, and his elegies are said to have been the models for those of Gallus. Fragments of his works are published in Meineke's *De Euphorionis Vita et Scriptis* (Berlin, 1823) and *Analecta Alexandrina* (Berlin, 1843), and in Kock's *Fragmenta Comicorum Græcorum* (Leipzig, 1880). The amours of Euphorion with Nicia, the wife of King Alexander of Eubœa, are frequently alluded to in the poems of the *Greek Anthology*.

EUPHRA′NOR (Lat., from Gk. Εὐφράνωρ). A sculptor and painter of Corinth, who lived in the middle of the fourth century B.C. His most celebrated painting was in the Stoa Basileios at Athens. It represented the twelve gods, Theseus with the People, and Democracy, and the charge of the Athenian cavalry at Mantinea (B.C. 362). Among his statues were an Apollo, a Paris, and a Leto, with Apollo and Artemis in her arms, fleeing from the serpent. Furtwängler (*Meisterwerke der griech. Plastik*, Berlin, 1893) has proposed to identify a number of well-known statues with ancient copies of the works of Euphranor, among them the "Dionysos" from Tivoli and the Athena Giustiniani of the Vatican.

EUPHRATES, û-frā′tēz (Lat., from Gk. Εὐφράτης, OPers. *Ufrātes*, Heb. *Perâth*, Assyr. *Purattu*, Ar. *Furāt*, Turk. *Frāt*, from Sumerian *Pura-mun*, great water). A river of Asia, forming, with its tributary, the Tigris (q.v.), the principal river system of the southwestern part of the continent (Map: Turkey in Asia, K 5). It has its source in the heart of Armenia, in two branches, the Kara Su, or Western Euphrates, and the Murad Su, or Eastern Euphrates, the former rising 25 miles northeast of the town of Erzerum and flowing southwest to a point below Seraijik, where it is met by the Murad Su, which rises on the southern slope of Ala-Dagh and flows west-southwest to the point of confluence. From Seraijik the Euphrates flows in a general southerly direction, inclining at first to the east, but later with a tendency westward toward the Mediterranean. In this part of its course it breaks through the Anti-Taurus, and flows among the mountains for 45 miles, emerging at Samsat, whence it continues uninterrupted by rapids to the sea, a distance of 1200 miles. Before reaching Rum Kaleh it changes its direction, and, flowing south, separates for some distance Mesopotamia from Syria and the deserts of Syrian Arabia. Curving to the southeast, it flows on without receiving any important tributaries for about 700 miles, until it is joined at Kurna by the Tigris. From Kurna the river takes the name of the Shat-el-Arab, and continues to flow in a southeast direction until, after being united by a canal with the Karun from the east, it discharges its waters through several arms into the Persian Gulf, 90 miles below Kurna. The total length of the Euphrates is over 1700 miles, while the area of its basin is estimated at 260,000 square miles.

Notwithstanding its size, the Euphrates is of little commercial importance, and has very little influence on the economic life of the region through which it flows. It is navigable for light vessels from Babylon to the sea, a distance of about 450 miles, but even the portion below the confluence of the Tigris is not always of sufficient depth for navigation. Aside from the Tigris, the chief tributaries are the Khabur and Nahr Belik from the east; from the west are received the intermittent waters of a number of wady-like streams. Originally the river emptied directly into the Persian Gulf; the accretions to the soil, due to deposits at the mouth, which, it is estimated, proceed at the rate of one mile in fifty years, have brought about the change and caused it to unite with the Tigris at Kurna.

Historically the Euphrates is second in importance to no river in the world. It flowed west of Assyria and through Babylonia, and is closely connected with the early Oriental world empires. In ancient times it carried considerable commerce and travel, being navigated by means of boats of wicker-work smeared with bitumen. The plains along its lower course were intersected by an elaborate system of irrigation canals, and, fertilized by the annual overflow, which takes place from the beginning of March to the end of May, were of great productiveness and supported a teeming population. In the Bible the Euphrates is '*the* river,' or 'the great river' (cf. Gen. xv. 18; Deut. i. 7). It was one of the four rivers of Eden, and the only one mentioned without description (Gen. ii. 14). In the dreams of the Hebrews concerning dominion it represented the eastern limit of their territory (cf. Deut. xi. 24; Joshua i. 4). In exilic times the Hebrews became very familiar with the river, and there are many allusions to it in the prophets, particularly Jeremiah. For centuries the river was the eastern limit of the Roman power, and under the caliphs its banks were lined with prosperous towns, where the arts and literature flourished. Consult: Chesney, *The Expedition for the Survey of the Rivers Euphrates and Tigris* (London, 1850); Peters, *Nippur: or, Explorations and Adventures on the Euphrates* (New York, 1897). See BABYLONIA.

EUPHROSYNE, ū̇-frŏs′ĭ-nē̇ (Lat., from Gk. Εὐφροσύνη, the personification of joy, from *εὔφρων*, *euphrōn*, joyous, from *εὖ*, *eu*, well + *φρήν*, *phrēn*, mind). One of the three Graces (q.v.).

EUPHTHALMINE, ū̇f-thăl′mĭn (from Gk. *εὖ*, *eu*, well + *ὀφθαλμός*, *ophthalmos*, eye). An artificial alkaloid. Its hydrochlorate is used in solution as a substitute for atropine and homatropine for dilating the pupil in examinations with the ophthalmoscope. Although it requires about thirty minutes to produce complete dilatation, it possesses the marked advantage that its effect passes off in from five to seven hours. Homatropine causes dilatation for twenty-four to thirty-six hours and atropine for several days. While effectually dilating the pupil, euphthalmine has little effect upon accommodation and can be used without danger of causing glaucoma (q.v.).

EUPHUES, ū̇′fū̇-ē̇z, or THE ANATOMY OF WIT. A famous romance by John Lyly (1579). The scene is laid in Athens and the hero, Euphues, is a graceful and witty young Greek. In form, the work follows the extravagant and flowery mode of speech then prevalent. It treats of the molding of English society through Italian influences, and of the right principles of education. A sequel was published in 1580 under the title *Euphues and His England.*

EU′PHUISM (from Gk. *εὐφυής*, *euphyēs*, clever, from *εὖ*, *eu*, well + *φυή*, *phyē*, nature, from *φύειν*, *phyein*, to produce). A term used in English literature to denote an affected style of language, fashionable for a short period at the Court of Queen Elizabeth. The word was formed from the title of the book which brought the style into vogue, the *Euphues* of John Lyly (1579). The style was imitated by Shakespeare in *Love's Labour's Lost,* and caricatured by Scott in *The Monastery.* See LYLY, JOHN.

EU′PHYLLOP′ODA. See BRANCHIOPODA.

EUPIONE, ū′pĭ-ōn (from Gk. *εὔπιων*, *eupiōn*, very fat, from *εὖ*, *eu*, well + *πίων*, *piōn*, fat). An extremely mobile oil, obtained from the lighter portions of the liquid products of the destructive distillation of wood, coal, etc.

EU′POLIS (Lat., from Gk. Εὔπολις) (c.446-411 B.C.). An Athenian poet of the Old Comedy, ranking with Cratinus and Aristophanes. His first play was produced in B.C. 429, when he was but seventeen years old. He produced in all fourteen, or, according to Suidas, seventeen pieces, of which seven won the first prize. In the early part of his career he was on terms of close friendship and collaborated with Aristophanes, but later the relation was changed so that each accused the other of plagiarizing from his dramas. Eupolis died apparently in B.C. 411 in a naval battle, in consequence of which misfortune it is said the Athenians thereafter exempted poets from military service. The fragments are collected in Meineke, *Fragmenta Comicorum Græcorum*, vols. i., ii. (Berlin, 1839-57); Kock, *Comicorum Atticorum Fragmenta*, vol. i. (Leipzig, 1880).

EURAQUILO, ū̇-răk′wĭ-lō (from Gk. Εὖρος, *Euros*, east wind + Lat. *Aquilo*, northeast wind, i.e., an east-northeast wind). The popular name, given doubtless by sailors, for the wind which struck the ship on which Paul was making his voyage to Rome. The ship had left the shelter of Cape Matala, on the south coast of Crete, with the purpose of making the winter harbor of Phenix (Authorized Version, Phenice), further westward on the same island (Acts xxvii. 13, 14). In the Authorized Version, following inferior manuscript reading, it is called Euroclydon. It came evidently in a sudden change from the mild south wind under which the ship was sailing, and consisted in a violent gale descending from the mountainous heights of the island and accompanied with typhonic manifestations.

EURA′SIANS (from *Europe* + *Asia*). A term of varied application. In India it has been used for more than half a century to denote the mixed offspring of European and Hindu parents. Following the geological designation of the seeming unity of the continents of Europe and Asia as Eurasia, the word Eurasians came to be used in an allied ethnographic and ethnological sense. Thus Keane (1896) finds the cradle-land of the Aryans in the Eurasian steppe, and Deniker (1900) makes a Eurasian group, to include such peoples (Ugrians, Turko-Tatars, etc.) which have representatives in both continents. Sergi, in his *Mediterranean Race* (London, 1901), applies the term Eurasiatic to that variety of man which "brought with it into Europe [from Asia in the later Neolithic period] flexional languages of Aryan or Indo-European type."

EURE, ẽr. A northwestern department of France (Map: France, G 2), formed from parts of the ancient Orléanais, Perche, and Normandy. Area, 2300 square miles. Population, in 1896, 339,312; in 1901, 331,184. Its surface is level. The principal river is the Seine, which, entering the department from the southeast, flows through it in a northwesterly direction to Pont-de-l'Arche. The Eure, from which the department derives its name, and the Rille, both affluents of the Seine, are the only other important rivers. The chief products are grain, hemp, flax, vegetables, and fruits, particularly apples and pears, from which large quantities of cider and perry are made. The breeding of cattle, horses, and sheep is favored by extensive meadow and pasture lands. There are extensive iron and copper works. Cotton goods, cloth, linen, glass, pins, and stoneware are likewise manufactured. Capital, Evreux.

EURE. A river in the northwestern part of France, and a tributary of the Seine (Map: France, H 2). It rises in the Department of Orne, flows first southeast into the centre of the Department of Eure-et-Loir, then north and northwest through the departments of Eure-et-

Loir and Eure, joining the Seine above Pont-de-l'Arche, after a course of about 112 miles, for 50 of which it is navigable.

EURE-ET-LOIR, ẽr′-â-lwär′. A northern department of France, formed chiefly from the ancient Province of Orléanais (Map: France, H 3). Area, 2268 square miles. Population, in 1896, 277,523; in 1901, 272,624. It is watered mainly by the Eure in the north and the Loir in the south, the two rivers from which it takes its name. It is, in general, level, the east and south being occupied by high and extensive plateaus, while in the west the surface is finely varied by hill and valley. The soil is fertile. Wheat, oats, and apples are largely produced. Capital, Chartres.

EURE′KA (Gk. εὕρηκα, I have found). An exclamation attributed to the philosopher Archimedes, who is said to have burst forth with the cry '*Eureka! Eureka!*' upon suddenly discovering the principle of specific gravity, whereby he was enabled to determine what proportion of silver alloy was contained in the golden crown of King Hiero of Syracuse. Hence, an exclamation of triumph at a discovery made.

EUREKA. A city and county-seat of Humboldt County, Cal., 225 miles north by west of San Francisco, on Humboldt Bay, connected with Pacific coast ports by regular steamship lines (Map: California, A 1). It possesses a fine harbor which has been improved by the United States Government and has a minimum depth of 24 feet. An extensive trade is carried on in redwood lumber, shingles, butter, fish, apples, and wool. There are numerous lumber-mills, a tannery, iron-foundry, woolen-mill, and other industrial establishments. Sequoia Park, a tract of redwood forest near the city, is still practically in its virgin state. There are a public library (Carnegie) and a fine court-house. The government, under a charter of 1895, is vested in a mayor, elected biennially, and a municipal council. First settled about 1850, Eureka became the county-seat and was incorporated in 1856. Population, in 1890, 4858; in 1900, 7327.

EUREKA. A city and county-seat of Woodford County, Ill., 19 miles east of Peoria, on the Toledo, Peoria and Western and the Atchison, Topeka and Santa Fé railroads (Map: Illinois, C 3). Eureka College (Christian), established in 1855, is situated here. The city owns and operates its water-works. Eureka was incorporated as a town in 1856. Population, in 1890, 1481; in 1900, 1661.

EUREKA. A city and the county-seat of Greenwood County, Kan., 109 miles southwest of Topeka, on Fall River, and on the Missouri Pacific and the Atchison, Topeka and Sante Fé railroads (Map: Kansas, F 4). The Southern Kansas Academy (Congregational) is situated here. The city has considerable trade in the products of the surrounding agricultural and stock-raising district. Population, in 1890, 2259; in 1900, 2091.

EUREKA. A town and the county-seat of Eureka County, Nev., 75 miles east of Austin, connected by rail with Palisade Station, 84 miles distant, on the Southern Pacific Railroad (Map: Nevada, F 2). It is the centre of a cluster of very rich mines of gold, silver, and lead, and is almost wholly engaged in mining, smelting, and refining. In 1880 Eureka had a population of 5000. It has suffered severely from fires, property valued at over $1,000,000 being destroyed in 1878 and 1879. Population, in 1890, 1609; in 1900, about 1875.

EUREKA SPRINGS. A city and the county-seat of Carroll County, Ark., on the Eureka Springs Railroad (Map: Arkansas, B 1). It is a noted health resort, popular for its picturesque and elevated situation among the Ozark Mountains, its healthful climate, and its mineral and medicinal springs, some fifty in number. In the vicinity of the city a fine grade of onyx is found. The water-works are owned by the municipality. Population, in 1890, 3706; in 1900, 3572.

EURIPIDES, û-rĭp′ĭ-dēz (Lat., from Gk. Εὐριπίδης) (c.480-406 B.C.). The latest of the three great Greek tragic poets. He was born, tradition said, in Salamis on the day of the great sea-fight with the Persians. His parents, Mnesarchides and Clito, were of humble station; they lived at one time in banishment in Bœotia, and on their return to Athens are said to have engaged in petty retail trade. Their son, however, had a good education. He produced his first play, *The Daughters of Peleus*, at the age of twenty-five. From that time he devoted himself to the tragic stage. His first play won but the third place, and he gained the first prize only after fourteen years of disappointment. This distinction he enjoyed but five (or, as one authority says, fifteen) times in all. Euripides was of a studious and speculative nature, and was a friend and disciple of Anaxagoras, Prodicus, Protagoras, Socrates, and others, although he attached himself to no particular philosophic school. He possessed a gloomy temperament, was morbidly sensitive, and apparently felt himself misunderstood by his fellow Athenians. He took no part in politics, but lived in his library. The latter part of his life he spent away from Athens, first in Magnesia, then at the Court of Archelaus at Pella in Macedonia. He died in the spring of B.C. 406 at Arethusa, near Amphipolis, and was buried not far from that city. At Athens a cenotaph was erected to him, the epitaph of which declared that all Greece was his monument, and that the earth of Macedon covered only his bones.

In sharp contrast to his two great predecessors, Æschylus and Sophocles, Euripides represents the new moral, social, and political movements which were transforming Athens at the end of the fifth century B.C. He is also distinguished from the earlier tragedians by the fact that his interest lay in the thought and experience of the ordinary individual far more than in the sufferings of legendary beings belonging to the heroic past; so that while he drew characters from the old mythology, he treated them in a thoroughly realistic fashion; they were no longer ideal personages far removed from every-day life, but contemporary Athenians representing every grade of society to be found in Athens at his time. In fact, Euripides shifted the tragic situation from a conflict between man and the divine laws of the universe to man's inner soul, where the struggle is between his better impulses and the evil suggestions of his baser self. He is furthermore the most modern of all the Greek dramatists in his tenderness and sentimentality;

in some plays he appears as the precursor of the modern romantic school. In his lost *Andromeda*, of which the theme was Perseus's affection for the princess whose life he had saved, he produced the only known example among the tragedies of antiquity of a plot based on the favorite motive of the modern novel.

Euripides shared in the current skepticism of the day as to the older religious beliefs, and many passages in his tragedies betray his doubts. His attitude not unnaturally brought down upon his head the wrath of the conservatives, of whom Aristophanes was the chief literary representative. In Euripides's language the speech of common life had a considerable part, and his style shows a remarkable smoothness and dexterity; Aristophanes actually imitated it, Aristotle praised it, so that it was the model for the writers of the later comedy. The structure of his plays, however, is often dramatically defective, as many of them are made up of brilliant detached episodes and do not form coherent units through which the plots are gradually developed. On the other hand, in other plays, as, for example, in the *Medea*, the plot is steadily developed from beginning to end. Euripides has been blamed for his use of the explanatory prologue, in which he makes known to the spectators the events which precede the opening of the play and oftentimes outlines coming events. But he deserves censure, not for his employment of such prologues, but for the manner in which he managed them, for many of them are mechanical and ten are burdened with long genealogies which deserve the ridicule that Aristophanes heaped upon them. He also resorts too often to the 'deus ex machina' (q.v.) to solve his tragic situations, and the choral songs have frequently nothing to do with his play. Yet with all allowances for his defects, Euripides remains a great tragic poet. His greatest strength lay, as was pointed out in antiquity, in the representation of human passion and in his recognition scenes. After the beginning of the Peloponnesian War Euripides enjoyed great popularity, and his fame was not confined to Attica alone. In the fourth century he was read and presented almost to the exclusion of the two older poets. The vases from southern Italy which have representations of scenes from his work attest his fame there in the fourth and third centuries B.C., and in the Roman and Byzantine periods he was highly esteemed and imitated. In modern times he has influenced English, German, and especially French dramatists.

Euripides took his plots from the same general sources as previous poets. A considerable number of plays are based on the legends of Thebes, Argos, and the stories of Heracles; the Trojan cycle had less charm for him, so that only about a fifth of his plots can be traced to that source, although ten of the extant plays, including the *Rhesus*, which popular taste has preserved to us, belong to this cycle. The myths of his native Attica, however, had a strong attraction for him, and he took pleasure in celebrating the Athenian heroes, Ægeus, Theseus, and Erechtheus. He also sought for subjects in new fields, especially for themes which exhibited violent passion or romantic adventures. Such were the stories of Bellerophon, Cresphontes, and Phaëthon, which he handled for the first time. He also treated his mythology with great freedom, sometimes varying it in different plays, or enlarging and developing a myth until it was practically his own invention.

Tradition says that he left ninety-two plays in all. Of these we possess but eighteen, and the *Rhesus*, which is almost universally regarded as spurious. The genuine plays are: *Alcestis* (438); *Andromache; Bacchæ; Hecuba; Helena* (412); *Electra; Heraclidæ; Hercules Furens; Supplices; Hippolytus* (428); *Iphigenia Aulidensis; Iphigenia Taurica; Ion; Cyclops* (the single satyr drama extant); *Medea* (431); *Orestes* (408); *Troades* (415); and *Phœnissæ.* Only the dates given are known with certainty; but the *Bacchæ* and *Iphigenia Aulidensis* were produced after the poet's death. Besides the above complete plays, over 1100 fragments of the other dramas have been preserved. Of the extant plays, the *Medea*, *Hippolytus*, *Bacchæ*, and *Iphigenia Among the Taurians* are the best.

The best critical editions are by Kirchhoff (Berlin, 1855); Nauck (Leipzig, 1871); Prinz and Wecklein (Leipzig, 1878 et seq.), and a complete edition with English commentary by Paley (London, 1858-60, 3 vols.; vols. i. and ii. in 2d ed., 1872-75). Commentated editions of single plays are very numerous; only a few of the best English editions can be named here: *Alcestis*, Earle (New York, 1894); Haley (Boston, 1898); *Bacchæ*, Sandys (2d ed., Cambridge, 1885); Tyrrell (London, 1892); *Helena*, Jerram (Oxford, 1881); *Heracleidæ*, Beck (Cambridge, 1882); *Hippolytus*, Harry (Boston, 1899); *Ion*, Verrall (Cambridge, 1890); *Iphigenia at Aulis*, England (London, 1891); *Iphigenia Among the Taurians*, England (London, 1880); Jerram (Oxford, 1885); *Medea*, Verrall (London, 1881); Allen-Moore (Boston, 1901); *Troades*, Tyrrell (London, 1897). The Scholia are best edited by Schwartz (Berlin, 1887-91). There is an excellent English translation in verse by Way (London, 1894-98); prose translation by Coleridge (London, 1885).

Consult: Mahaffy, *Introduction to the Study of Euripides* (London, 1879); Decharme, *Euripide et l'esprit de son théâtre* (Paris, 1893); Verrall, *Euripides the Rationalist* (Cambridge, 1895); Haigh, *Tragic Drama of the Greeks* (Oxford, 1896); England, *Euripides and the Attic Orators* (London, 1898); Nestle, *Euripides, der Dichter der griechischen Aufklärung* (Stuttgart, 1901); Huddilston, *Greek Tragedy in the Light of Vase Paintings* (New York, 1898).

EURI'PUS (Lat., from Gk. Εὔριπος). The narrowest part of the channel between the island of Eubœa and the mainland of Greece (Map: Greece, G 3). Opposite Chalcis the width of the strait is but a little over 40 yards, and it is very shallow. Here a rock in the channel facilitated the construction of a bridge as early as B.C. 410. Exceedingly swift and variable currents exist in the strait. The name is sometimes used in a wider sense to designate the southeastern portion of the Eubœan channel.

EUROC'LYDON. See EURAQUILO.

EURO'PA (Lat., from Gk. Εὐρώπη, *Europē*, from Assyr. *ērēbu*, to set (of the sun), although the Greeks etymologized the word as broad-eyed, from *εὐρύς*, *eurys*, broad + *ὤψ*, *ōps*, eye). In Greek legend, a daughter of Agenor (q.v.), or Phœnix, King of Phœnicia. Her beauty attracted the attention of Zeus, who appeared in the form of a white bull, and carried her to Crete, where she became the mother of Minos, Rhadamanthus, and Sarpedon. Zeus presented her with the bronze man, Talos, a dog who never lost his prey, and a spear which never missed its mark, and later gave her to King Asterius of Crete, who adopted her sons. After her death she was worshiped under the surname Hellotia, or Hellotis. Modern mythologists are inclined to see in Europa a moon goddess, or else an earth goddess of fertility, like Demeter. See also CADMUS.

EUROPA AND THE BULL. A well-known painting by Titian (1562), representing the Phœnician damsel borne through the waters on the back of the metamorphosed Zeus, followed by three Cupids, one being seated on a dolphin's back. The painting is now in Cobham Hall, England.

EUROPE. The name is derived, according to the researches of Kiepert, Egli, and other scholars from the old Assyrian Irib or Ereb = sunset or west, which was applied to Greece to distinguish that region from Asia Minor, which was designated as Assu = sunrise or east. These names, in their later forms, were finally extended, the one from Greece over all Europe, and the other from Asia Minor over all Asia.

Europe is the smallest of the continents excepting Australia. Its area is about 3,850,000 square miles, or approximately one-fourth greater than that of the United States exclusive of Alaska. It includes, with its polar and other islands, only 7.8 per cent. of the land surface of the world. It is surrounded on three sides by the sea, but its eastern frontier for about 2000 miles joins that of Asia. The political boundary in the east does not entirely conform with the natural boundary. The line is carried to the east of the central and southern Ural Mountains, the natural boundary, in order to include the rich mining districts, east of the mountains, in Russia; to the south of the Ural Mountains the Ural River is the boundary. Between the Black and Caspian seas, the main ridge of the Caucasus is generally taken to be the boundary between Europe and Asia. The natural boundary in the southeast is, however, now considered by some geographers to be through the depressions of the Sea of Azov and the East and West Manitch rivers to the Caspian Sea, the entire Russian possessions south of the Manitch rivers (Ciscaucasia and Transcaucasia) being in this way included in Asia. The continent extends west and east through nearly 75 degrees of longitude from Cape Roca, near Lisbon, to the Tobol River. Penetrating the polar ice zone (North Cape, 71° 11′ N.), its most southerly point is Cape Tarifa, Spain, which is crossed by the thirty-sixth parallel. In proportion to area it has a much longer coast-line than any other continent, over 20,000 miles, including the more important indentations, but double that length if the entire shore line is closely followed. While Europe is merely a peninsula of the great landmass of Asia, there are many natural and historical reasons which make it imperative to treat it as a distinct subdivision of the earth's surface.

The situation of Europe gives it a central position in the land hemisphere. It is separated from America by the comparatively narrow Atlantic Ocean. Africa is plainly in view across the Strait of Gibraltar, nine miles wide; Europe also closely approaches Africa at the strait between Sicily and Tunis.

TOPOGRAPHY. Three phases of the topographic aspects of Europe are particularly noteworthy. (1) The dissected, pointed, broken character of a large part of the coast-line, giving it relatively a greater coastal development than any other continent possesses; (2) the predominance of low plains and the small area of high table-lands inclosed by mountains, a characteristic feature of Inner Asia; (3) the absence of deserts, Europe being the only continent without desert areas.

On the Atlantic and the Mediterranean sides is a rich island world and a number of very large peninsulas, the islands and peninsulas embracing about half as large an area as that of the continental mass. Most of the Atlantic islands rise from the continental shelf, were once a part of the continent, and are now the ruins of its former edge. The ocean far and wide around them does not exceed 700 feet in depth. Iceland is included in Europe because it stands on the wide, high submarine plateau extending from Norway to Denmark Strait between Iceland and Greenland, separating the Atlantic from the polar ice basins. These fragments torn from the continent are particularly numerous north of the fiftieth parallel. Very conspicuous islands among many hundreds are Nova Zemlya, Vaigatch, and Kolguyev (on the Arctic side); Zealand and other Danish islands, Gothland, Osel, Dagö, and Åland (in the Baltic); and most important of all, the British Isles, Shetlands, and Orkneys, composing the British group; to these may be added the distinctive polar islands, Spitzbergen, Bear Island, Jan Mayen, and Franz-Josef Land. The islands in the ocean, including the Baltic, have an area about six times as large as those of the Mediterranean, which include the Balearic group, Sardinia, Corsica, Sicily, Crete, Cyprus, and the numerous islands of the Grecian Archipelago in the Ægean Sea. The Scandinavian Peninsula, the largest in Europe, and the Jutland Peninsula admit the deep sea into the continental mass. Here is the Mediterranean of the north, the Baltic Sea with its three extensions, the Gulfs of Bothnia, Finland, and Riga. Only one-fourth as salt as the ocean, and therefore freezing more easily, most of this inland sea is unavailable for navigation during the ice months. The many large rivers emptying into the Baltic and its narrow connection with the ocean account for its small salinity. On the other hand, the North Sea, between Great Britain and the continent, is, in fact, a part of the Atlantic and has the full effect of its tides. Brittany is a peninsular projection, which bounds the deep recess of the Bay of Biscay on the north.

In the extreme south the continent is dissolved into three great peninsulas—the Iberian, the Italian, and the Balkan. The northern part of the Mediterranean is divided by these peninsulas into several sections: the Ægean Sea, between the Balkan Peninsula and Asia Minor, connected with the inclosed basins of the Sea of Marmora and the Black Sea by the narrow strait of the Dardanelles and the Bosporus; the Ionian and the Adriatic seas between the Balkan Peninsula and Italy; and the Tyrrhenian Sea, in the triangular space between Italy and the three large islands of Sicily, Sardinia, and Corsica; the great bight north of Corsica is the Gulf of Genoa.

All the prominent forms of flat and steep coasts are represented on the shores of Europe. The fiord coasts of Norway and western Scotland, the deep and comparatively wide indentations of the west coasts of England and Ireland, Brittany, and northwest Spain provide a great number of excellent natural harbors, which promoted the sea trade of the Middle Ages, and has stimulated the immense development of ocean commerce in modern times. The most unfavorable harbor conditions are found along the flat, sandy coasts of the lowlands of the Netherlands and Belgium, northwest Germany, the west side of Jutland, and the French coast on the Bay of Biscay. Here, as also for the most part on the east side of Great Britain, only river-mouths offer good harbors. The importance of the sea trade here depends upon flood tides and favorable conditions at the river-mouths, the largest vessels being able to navigate the rivers only at high tide. A large number of the Atlantic cities are river ports, Hull and London, Antwerp, Rotterdam, and Amsterdam, Hamburg and Bremen, Havre and Bordeaux, Oporto and Lisbon. River ports are also most numerous on the Baltic, though shipping there does not have tidal advantages. A peculiarity of the German Baltic coast is the sand-dunes parallel with the shore which afford complete protection from waves.

The conditions are very different on the Mediterranean shores, where high, steep coasts are the prevalent feature, flat coasts and delta formations being exceptional. The flow and ebb of the tide are insignificant, the little rivers are unimportant for commerce, and there are no noteworthy river ports, which reappear only on the shores of the Black Sea and the Sea of Azov. Many important ports on the Mediterranean have developed without the advantages afforded by navigable rivers.

Europe owes its commercial supremacy to the remarkable development of its coast-line, lengthened as it is by many islands, channels, and the deep penetration of the sea into the land.

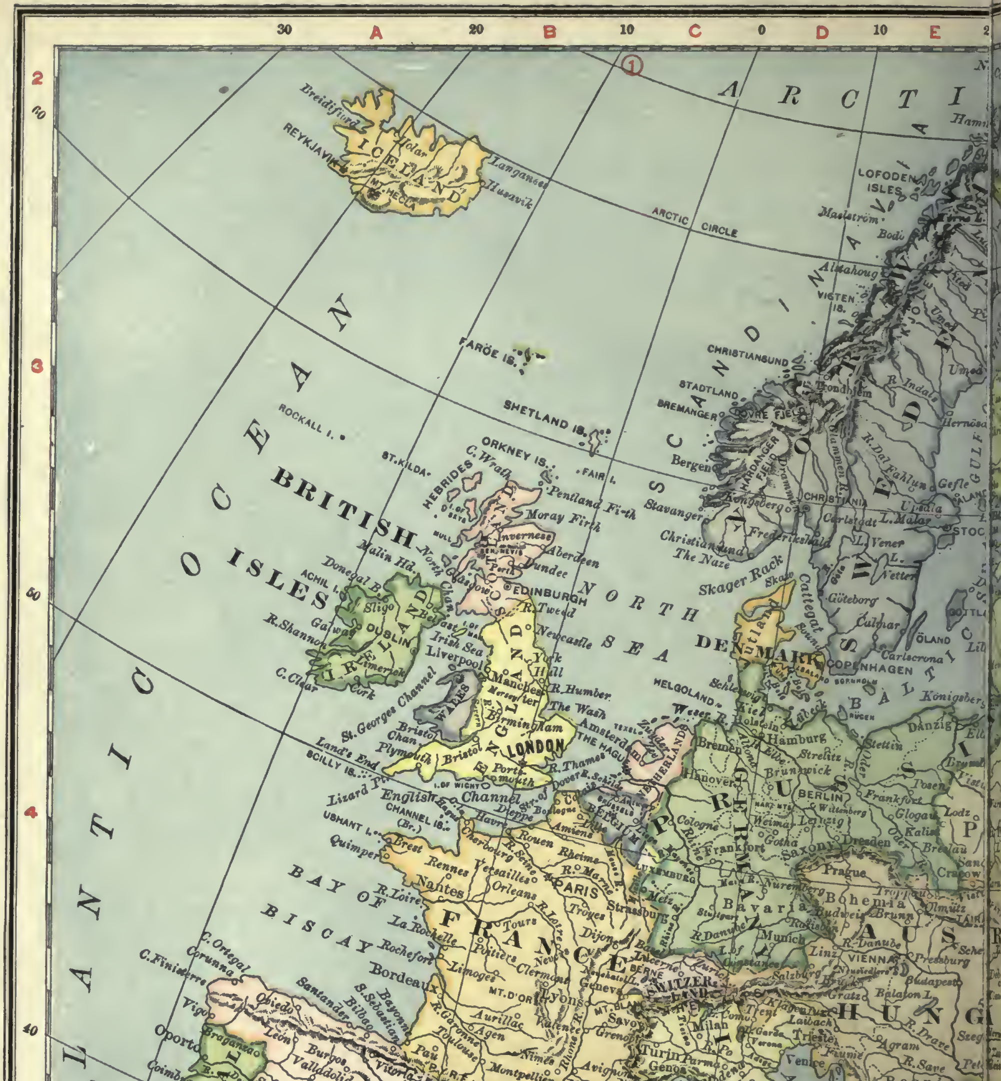
The three most conspicuous topographic forms of the continental mass are the highland belt in the south, the secondary mountains north of it, and the lowlands. The highland belt is the western member of the great mountain zone that extends through the Old World from the upper courses of the Yang-tse and Hoang rivers to the Atlantic. This high zone is extended into Europe by the Caucasus Mountains (Elbruz, about 18,500 feet), and the mountains of the Crimea. It is then interrupted by the depressions of the Black and Ægean seas, beyond which lies the Alpine system. The Alpine system consists of a series of long and connected mountain chains of which the Alps are the heart, the highest and most prominent features. The Apennines, the Balkan Mountains, and the Carpathians, sweeping around the basin of the Danube to the Balkans, are directly connected with the Alps. The high mountains of the Pyrenees have no superficial connection with the Alps; neither (except as the return chain of the Apennine system) has the Sierra Nevada of southern Spain, which is regarded as the frontal range of the Atlas Mountains of Africa. The highland belt west of the Black Sea reaches its culmination in the Alps (Mont Blanc, 15,780 feet), which are at once the highest and most passable of all these mountains. No other high mountains of equal extent, except the Rocky mountains in the United States, have so many passes that are easy to cross; the Alps, therefore, despite their vast snow-fields and numerous glaciers, offer little or no impediment to commerce, while the Pyrenees are practically impassable except around their extreme ends.

The mountains to the north of the highland belt are of a very different character. While they include mountain ranges, they are much shorter than in the highland belt. Mountain chains, groups of mountains, isolated mountains, and plateaus are intermingled in great variety. With the exception of the Scandinavian Mountains, they are all comparatively low, and the Germans have, therefore, designated them as the Mittelgebirge, intermediate or secondary mountains. The groups of the northern mountains are the mountains of southern Poland, the mountains of southern and central Germany and France (Jura, Vosges, Bohemian Forest, Erzegebirge, Riesengebirge, Thuringian Forest, Harz, Black Forest, etc.), the British mountains, and the Scandinavian-Finnish mountains. The highest are the mountains of Scandinavia, which cover most of Norway, and slope steeply to the sea, but gradually into Sweden. Far to the east and isolated from all other mountains of Europe are the Urals, the longest mountain chain of the continent, rising steeply from Asia, but sloping very gradually to the plain on the European side.

The continent of Europe has but a single active volcano within its borders—Vesuvius. Etna is on the island of Sicily. Other insular volcanoes are Stromboli, the active parts of Santorin, and Skaptaz-Jökul in Iceland. Among the ancient volcanic regions may be mentioned the Alban Mountains of Italy, the Tokay District of northern Hungary, Auvergne in France, the Eifel region of Germany, and the northwest of the British Isles (with the Giant's Causeway, Fingal's Cave, etc.).

Two-thirds of the continental mass is lowland. The vast low plain of North Asia, interrupted only by the Urals, is continued through Russia, the northern half of Germany, and through France to the Pyrenees. Smaller plains, both high and low, are also found within the mountain lands. The most important of these high plains are those of Switzerland (between the Jura the Alps), where most of the people live, the plain being as densely populated as Germany or France; the plains of South Germany along the northern edge of the Alps; and the two high plains of Castile in Spain. The most important of the mountain-inclosed lowlands are those of the Alpine streams; the great, rich plain of the Po Basin; the plains of the Upper Rhine; and the four great lowlands of the Danube Basin, including a large region around Vienna, the upper and lower plains of Hungary, a region of wheat and grazing, and the Wallachian Plain, one of the granaries of Europe.

Generalizing these facts as to the topographic forms of the continent, it may be said that Europe is divided into two parts, the eastern part Russia, and the western part the remainder of the continent. The eastern part is an unbroken lowland, mountains rising only on its eastern and southern edges. The western part has with its plains also the two forms of mountain lands above mentioned. The eastern part is broad, massive, little articulated; or, in other words, it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BRITISH ISLES
Inverness
Aberdeen
Dundee
Perth
Glasgow
EDINBURGH
R. Tweed
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The Wash
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ENGLAND
Birmingham
Bristol Chan.
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LONDON
R. Thames
Plymouth
Portsmouth
Dover
Land's End
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I. OF WIGHT
Lizard Pt.
English Channel
CHANNEL IS. (Br.)
USHANT I.
Brest
Quimper
Cherbourg
Havre
Dieppe
Boulogne
Calais
Amiens
Lille
Rouen
R. Seine
Rheims
R. Marne
Rennes
Versailles
PARIS
Nantes
Orleans
R. Loire
Troyes
Strassburg
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FRANCE
Rochefort
Poitiers
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R. Garonne
Nimes
Montpellier
Avignon
Marseille
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Bayonne
G. of Lyons
C. Creus
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C. Ortegal
Corunna
C. Finisterre
Vigo
Oviedo
Santander
Bilbao
S. Sebastian
Leon
Burgos
Vitoria
Valladolid
MT. MALADETTA
Andorra
Saragossa
R. Ebro
Salamanca
Segovia
MADRID
SPAIN
Guadalajara
Barcelona
Tarragona
Toledo
Talavera
Valencia
R. Guadiana
Ciudad Real
Badajoz
Cordova
Guadalquivir R.
Sevilla
Granada
Murcia
SA. NEVADA
Alicante
Cartagena
Malaga
Almeria
C. de Gata
Gibraltar (British)
Tarifa
Ceuta
Tangier
Tetuan
Cadiz
C. Trafalgar
Strait of Gibraltar
C. Maria
C. St. Vincent
Oporto
Braganza
R. Douro
Coimbra
PORTUGAL
R. Tagus
Torres Vedras
LISBON
C. Roca
Setubal
R. Elvas
BALEARIC ISLANDS
MINORCA
MAJORCA
IVIÇA
FORMENTERA
ATLANTIC OCEAN
MEDITERRANEAN
Oran
Algiers
Bona
Tunis
C. Bon
ALGERIA
TUNIS
MOROCCO
Morocco
AFRICA
Meridian of Greenwich
G. of Cabes
Tripoli
G. of Sidra
PANTELLARIA
GOZO
MALTA (British)
LAMPEDUSA
CORSICA
Bastia
Ajaccio
St. of Bonifacio
SARDINIA
Sassari
Oristano
Cagliari
C. Spartivento
ELBA
SCANDINAVIA
LOFODEN ISLES
Maelström
Bodö
Alstahoug
VIGTEN IS.
CHRISTIANSUND
STADTLAND
BREMANGER
DOVRE FJELD
Trondhjem
HARDANGER FJELD
Bergen
Stavanger
Kongsberg
CHRISTIANIA
Drammen
Christiansand
The Naze
Frederikshald
Skager Rack
Skaw
Cattegat
Jutland
DENMARK
COPENHAGEN
BORNHOLM
HELGOLAND
Schleswig
Kiel
Holstein
Lübeck
RÜGEN
Weser R.
Bremen
Hamburg
Elbe
TEXEL
Zuider Zee
Amsterdam
THE HAGUE
NETHERLANDS
R. Schelde
Antwerp
BRUSSELS
BELGIUM
LUXEMBURG
Metz
Cologne
Hanover
Brunswick
Strelitz
Stettin
Danzig
Königsberg
BERLIN
Wittenberg
Frankfort
Posen
Glogau
Weimar
Leipzig
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Dresden
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Stuttgart
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Nuremberg
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Prague
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Venice
Trieste
Laibach
Gratz
Klagenfurt
Salzburg
Fiume
Agram
R. Drave
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Pisa
Florence
Leghorn
R. Arno
Tuscany
Perugia
Ancona
Loretto
ITALY
ADRIATIC SEA
Civita Vecchia
R. Tiber
ROME
Gaeta
Foggia
MT. VESUVIUS
Naples
ISCHIA
Salerno
Taranto
G. of Taranto
Cosenza
LIPARI IS.
Messina
Palermo
MT. ETNA
SICILY
Reggio
C. Spartivento
St. of Messina
Syracuse
C. Passaro
Bosnia
Banialouka
Bosna Serai
Zara
Spalato
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Durazzo
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L. Wener
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Upsala
Carlstadt
Göteborg
Calmar
ÖLAND
GOTTLAND
Carlscrona
STOCKHOLM
Gefle
Fahlun
R. Dal
Hernösand
R. Indals
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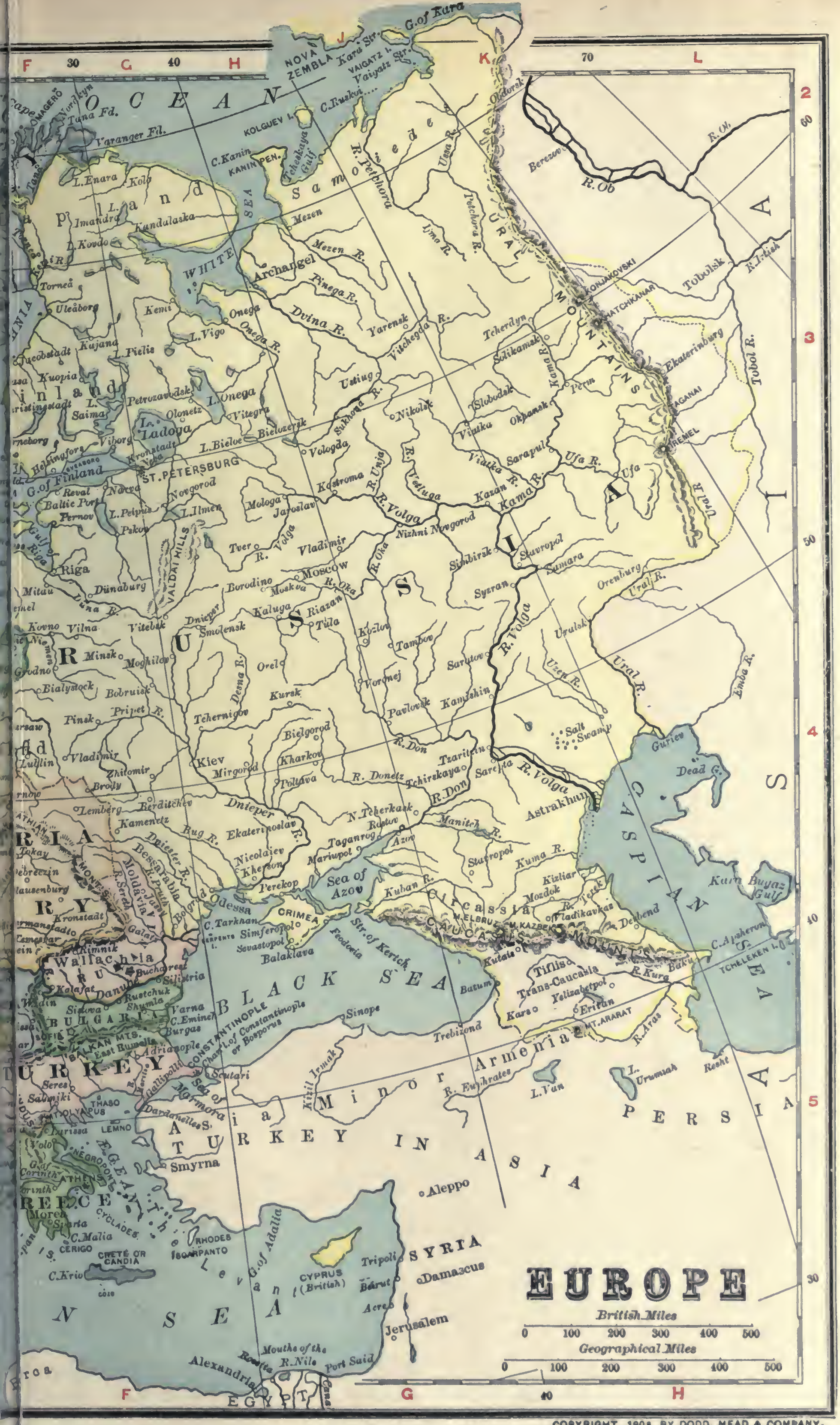

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is not made up of connected segments. It suggests North Asia, from which it is projected. The western part is narrow, richly articulated, open everywhere to the influences of the sea. The character of the eastern part is uniformity; that of the western part, diversity.

HYDROGRAPHY. The chief water parting of the continent may be shown by a line drawn from the central Urals, southwest across the Carpathians, through the secondary mountains of Germany and France to the Iberian Peninsula. All the rivers northwest of this line flow to the Arctic Ocean, the Baltic and North seas, the English Channel, or the Atlantic; all rivers southeast of the line flow to the Mediterranean, the Black, and the Caspian seas. The largest rivers are on this southeastern slope. The arrangement of the rivers of the eastern part of Europe (Russia) is simple. The Petchora, Dvina, Düna, and Niemen flow to the northwest, and the Ural, Volga, Don, Dnieper, and Dniester to the south. The distribution of rivers in the western part is more complicated. Each of the five chief outlying members of the continent (the three southern peninsulas, Scandinavia, and the British isles) has its own river system. In the continental mass the slopes from the mountains to the low plains north and south of them give direction to the river courses. The Vistula, the Oder, the Elbe, the Weser, the Rhine, the Seine, the Loire, and the Gironde follow the slope to the north and west; only the Rhine, of all these rivers, comes out of the Alps. Three rivers are exceptions to this rule; for the Danube, rising in the German Mittelgebirge, the Po, and the Rhône, rising in the Alps, do not flow directly away from the mountains, like the northern rivers, but along their edges or near them, the Danube and Po to the east and the Rhône to the west and south.

The rivers of Europe offer extraordinary advantages for commerce, although the two largest of them, the Volga and the Danube, empty into inland seas, the Volga into the Caspian, which has no outlet, and the Danube into the Black Sea; none of the great rivers is impeded by cataracts as in Africa, and their upper courses are not situated on table-lands of enormous height, unfavorable for development, as in Asia. But the rivers are so grouped that it has been possible, with the aid of comparatively short and easily dug canals connecting them, to make continuous waterways in various directions across the continental mass. Thus freight-boats ply through the land from Bordeaux to Cette; from Havre and Rotterdam to the mouth of the Rhône; from Amsterdam to the mouth of the Danube; from Danzig and Riga to Kherson on the Dnieper and thence to the Black Sea; from Saint Petersburg and Archangel to Astrakhan on the Caspian. The longest river and canal routes of Russia are those connecting the Caspian Sea and the Arctic Ocean, the Caspian and the Baltic, and the Black Sea and the Baltic. Boats loaded on the Vistula in Russia may be sent direct, by inland routes, to all the ports of North Germany, and the Netherlands, Antwerp, and Havre. The importance of the Volga and the Danube, while very great locally, is diminished by the fact that they flow toward Asia and away from the great centres of commerce. Most of the Mediterranean rivers are small, and of little commercial importance; even the large Rhône is too shallow for the highest usefulness. The rivers of the Atlantic watershed, including its tributary northern seas, are those that have had a profound and far-reaching influence upon the development of the world's ocean trade.

Fresh-water lakes are particularly numerous in three regions: on the Swiss plain between the Alps and the Jura; in the British Isles; and in a wide territory bordering on the Baltic in Scandinavia and northwestern Russia. The largest are on the east and south of the Scandinavian mountains, the Ladoga and Onega of Russia being the greatest of Europe's sweet-water lakes. The largest number are in Finland. These northern lakes were formed by the ancient glaciers, which left the marks of their passage deeply graven in the surface of the land, forming many lake basins. As the Swiss plain is a centre of radiation for rivers, it is one of the important lake regions. Nearly all the larger lakes are important in the inland systems of transportation. There are salt lakes in that part of Europe farthest from the sea, where the evaporation is greater than the precipitation or the river basins have no outlet to the sea. On the borders of European Russia and Asia is the Caspian Sea, the largest salt-water lake in the world.

GEOLOGY. Broadly speaking, Europe may be divided into three principal regions: (1) To the northeast of the Carpathians, the chief characteristic of the geological structure of Russia is the almost horizontal position of the sedimentary beds. In other words, the plications and dislocations of the rocks that mark the geology of the south and west are for the most part lacking in eastern Europe. (2) The south of Europe, including the Alpine system, is a region of great plications, relatively recent (the Tertiary period), with elevated mountains. (3) The rest of Europe, from Bohemia to Spain and Scandinavia, shows ancient massifs plicated in the Archæan epoch, whose inequalities of relief have been largely modified by erosion. These primary massifs are separated by large areas of Mesozoic and Tertiary beds (the low plains), that in general are not plicated.

The geological structure of the mountain systems is varied and complicated. The Alps are composed of a granite nucleus with stratified beds, greatly faulted and folded, upon their flanks. The Jura is composed mainly of limestones, greatly folded, with subsequent erosion. The Pyrenees, on the north boundary of Spain, are also of folded stratified rocks, as are many of the ranges traversing the plateau of the Iberian peninsula. The Apennines, one of the most recently formed ranges of Europe, is composed largely of Tertiary beds, much folded, the folds being arranged *en échelon*. In the south, the Carpathians and Balkans are composed of a central nucleus of metamorphic schists, with stratified limestones upon their flanks. The Ural Mountains are of crystalline rocks. The mountains of the Scandinavian peninsula are of great age, being in large part Archæan with granites and schists, while down the slope toward the Baltic more recent formations successively appear, and in the southeast Triassic, Jurassic, and Cretaceous rocks are found. The great plain of Europe is floored by Cretaceous and Tertiary beds, except in Finland, where Archæan rocks, stretching across from the Scandinavian Peninsula, cover the land. The mountainous portions of the British Isles are chiefly composed of granites and schists, while the lowlands are floored in great part with Jurassic beds. The northern half of Europe was in recent geologic time covered by a great ice sheet, which in its retreat has covered the land with glacial deposits, besides having by its erosion greatly modified the surface, changing the courses of the streams and scouring out lake basins. The soils of this portion of Europe are in great part composed of glacial silt and detritus, transported by this great sheet of ice.

Carboniferous coal deposits have been found in many parts of Europe between the parallels 40° and 60° N.; in eastern, southern, and west central Russia, Austria-Hungary, Germany, Belgium, France, Spain, Scotland, England, and Wales. Those of England and Wales are of special value and importance; the proximity of the English coal-mines to the sea and the leading coal-buying countries make England the greatest coal-exporter. The rich distribution of iron ores, together with the abundant occurrence of coal, gave Europe its manufacturing supremacy. Great Britain, mining coal and iron in the same or adjoining fields, produces about one-half of all the pig iron of Europe, drawing also, like Germany, upon the superior steel-making ores of Spain and Sweden. Nearly two-thirds of the iron of Germany comes from the west, where iron is closely associated with the coal-fields of the Saar. Belgium, mining iron on the coal-fields around Namur and Liège, has been called Little England, because coal and iron occur together. The best iron ores of Austria are not found near her coal, and this is true also in France except around Le Creusot and Saint-Etienne. Nine-tenths of the iron mined in France comes from the great field on which the city of Nancy stands. Iron is widely distributed in Russia, but many of the mines are not yet connected by rail with the main sources of coal. Germany is the world's largest source of zinc, and the Belgian mines are among the richest in Europe. The tin-mines of England are the largest European sources of this metal. Russia supplies nearly all the platinum of the world. Most of the sulphur used in the industries comes from Sicily and South Italy. Russia is the fourth largest producer of gold in the world, Germany the fourth and Spain the sixth largest producer of silver; Spain and Portugal are, next to the United States, the largest producers of copper, and Spain provides the largest supply of quicksilver, and is surpassed only by the United States in lead. Nearly every country produces its own salt, either from rock beds or by evaporating sea-water in saline marshes. The Netherlands and Switzerland are lacking in useful minerals, and Italy has no coal to smelt her iron ores.

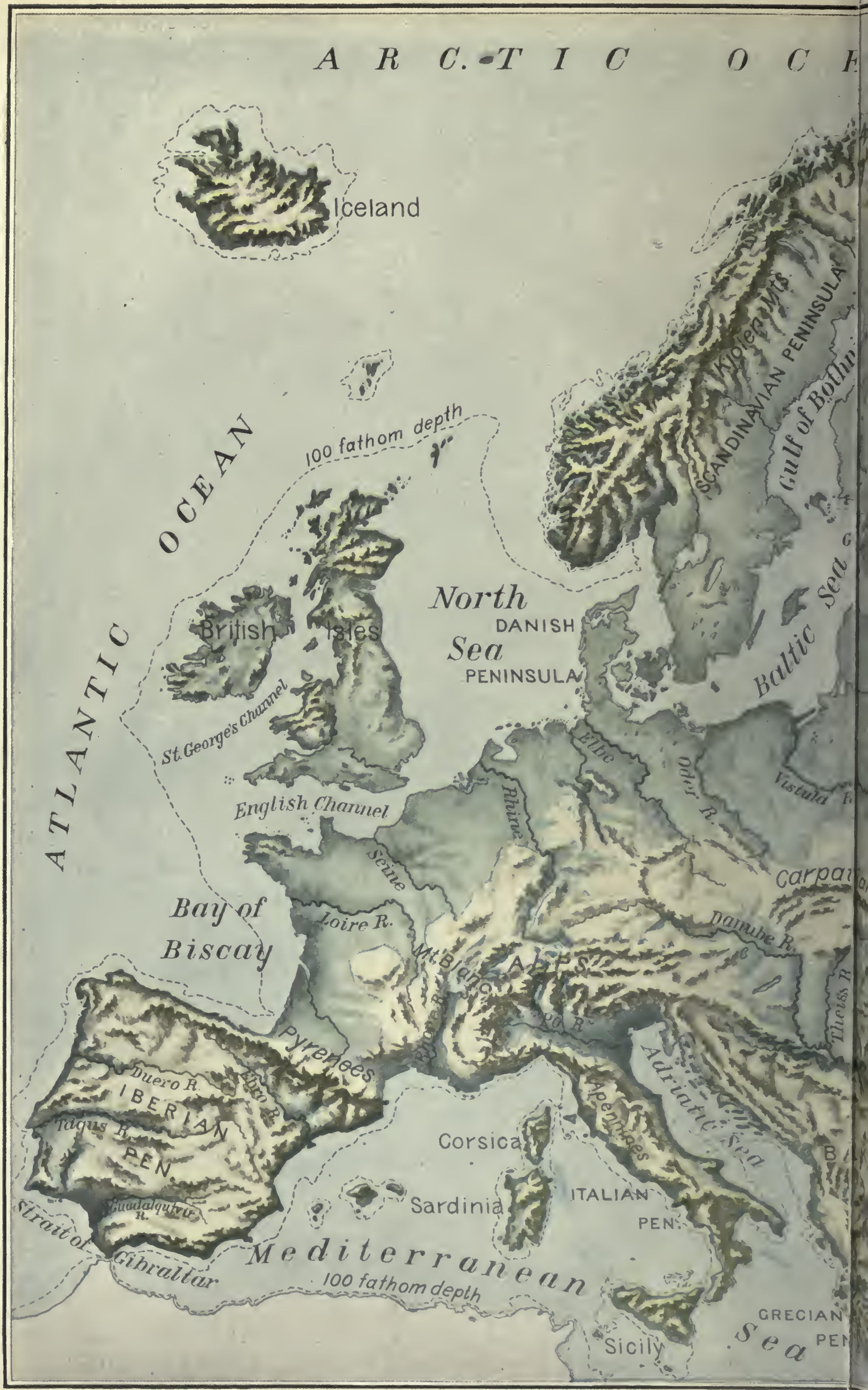
Climate. Europe is the only continent that lies entirely outside of the tropical zone, and only a small part of it is included in the frigid zone. The ameliorating influences of the North Atlantic and the westerly winds that blow over it are felt far east along the shores of the Arctic Ocean, so that at Katharine Haven, on the Murman Coast, the harbor is practically ice-free the year around. Thus, though the continent extends several degrees of latitude north of the Arctic Circle, very little of it is under polar influences. The continent lies in the temperate zone; and of all the land-masses in the same latitude it has the mildest and most genial climate. The warm winds from the Atlantic, the prevailing winds, have almost everywhere free access into the interior, sweeping up the arms of the sea and across the low coasts and plains, not only mitigating high and low temperatures, but also giving wide distribution to the rainfall. The fact, also, that the mean elevation of the continent above the sea is very much lower than that of any other continent excepting Australia (only about 950 feet, according to the results obtained by Supan and De Lapparent), emphasizes the prevailing temperate influences. In all parts of the continent there is sufficient warmth and rainfall for agriculture except where farm operations are prevented by cold in the extreme north and in the highest mountain regions, and by dryness on the salt steppes of the Caspian Sea.

The eastern part of Europe, however, is remote from the influence of the sea, and has the continental rather than the sea climate. The mean annual temperature, therefore, declines not only from south to north, but also, except along the Mediterranean, from west to east, e.g.: Greenwich, 49.7° F.; Berlin, 48.4°; Warsaw, 44.9°; Saratov (East Russia), 41.7°—these four places being in nearly the same latitude. But while the yearly mean of temperature is lower in the east than in the west of Europe, the summer temperature is higher in the east than in the west, because the interior land-mass becomes more heated than the regions bordering the sea with their more equable climate. In the south the influence of the Mediterranean is to impart to the countries along its shores a very uniform climate, the Alpine system also contributing to this advantage by warding off the cold northeast winds.

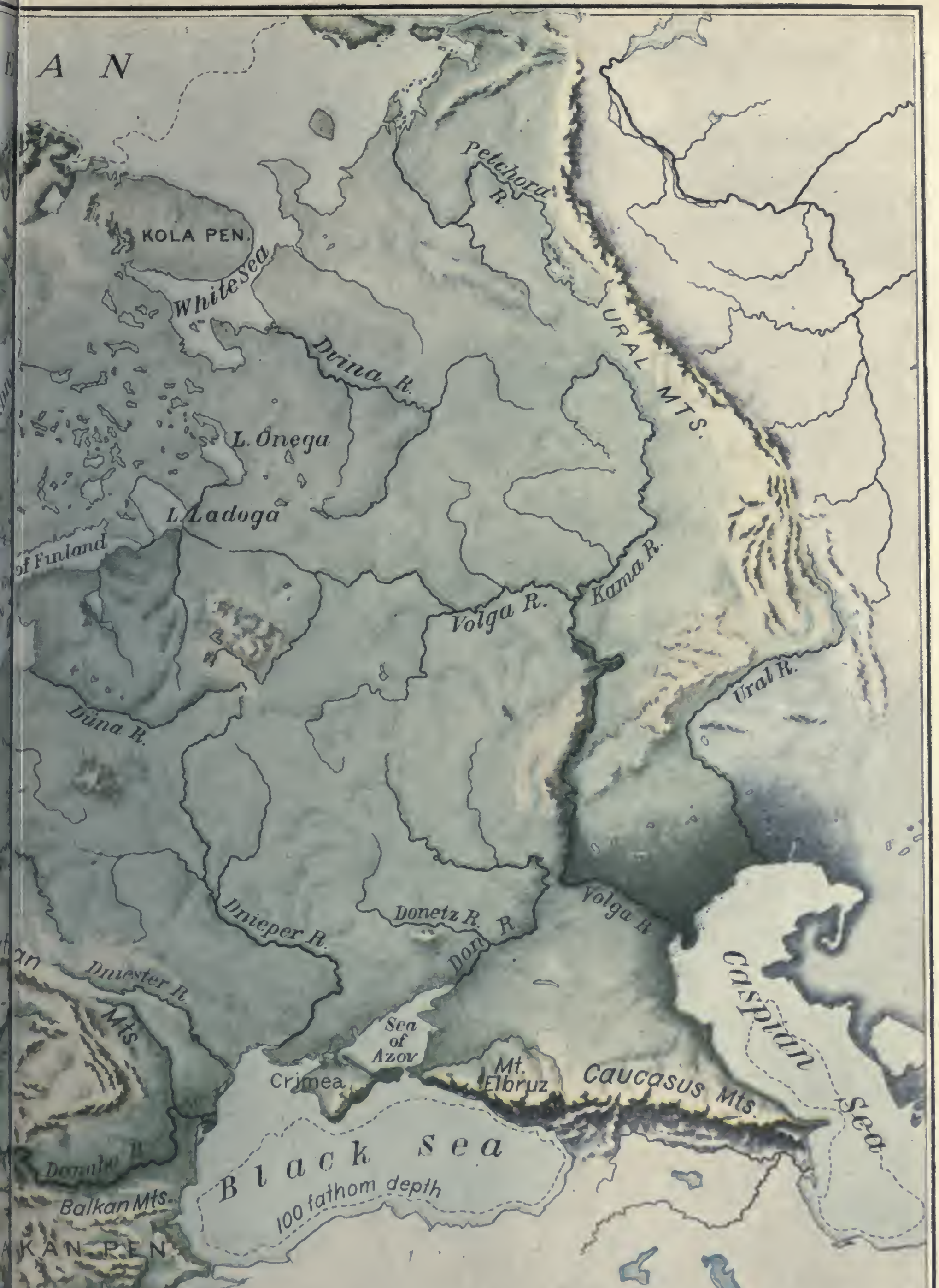
The precipitation decreases with distance from the Atlantic, the eastern part of the continent being much drier than the western, and driest along the north coasts of the Black and Caspian seas, where forest gives place to steppe. In no region, however, is the country so dry as to become a desert. In the northern half of Europe the precipitation is quite well distributed throughout the year, while winter rains predominate in all the Mediterranean countries. In a large part of Spain, for example, irrigation is the basis of agriculture because most of the rain falls after the growing season. Many local conditions modify both temperature and quantity of precipitation. The Scandinavian mountains, for example, are the cause of the larger precipitation on the west than on the east side of the peninsula; they also exclude the icy northeast winds of winter from the west harbors of Norway, which are ice-free.

Flora. If temperature be taken as the determinant—perhaps the simplest method in classifying the flora of Europe—three general regions are observed which more or less overlap one another. In general, the limits of these regions vary with the isotherms and with the coast-lines, but are modified by mountain ranges and rivers; the summits of the former affording homes to boreal species, the valleys of the latter allowing less hardy plants to extend inland into colder localities than they could otherwise reach.

The Arctic region, mainly tundra, which in northwestern Europe finds its southern boundary on the poleward side of the Arctic Circle, and in the northeastern part of the continent extends considerably to the south of this line, is char-



Lowlands, below 1,000 Feet elevation, are shown in Green.


PHYSICAL MAP OF EUROPE

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Highlands, above 1,000 Feet elevation, are shown in Buff.

acterized on its extreme northern border by lichens and mosses, which gradually give place southward to perennials of wonderful hardiness and longevity, but of small stature, slow growth, and inferior powers of reproduction by seed. The mountains throughout the continent present similar gradations, the vegetation at the highest altitude corresponding more or less closely to that in the highest latitudes and disappearing at lower elevations among species of more temperate regions, which gradually supplant it as the altitude is reduced and the temperature consequently increased. By far the most common species of this Arctic flora are the saxifrage, potentilla, poppy, scurvy-grass, crowfoot, all of which bear showy flowers; and stunted, trailing junipers, willows, and birches, which are buried under the snow during the long winters. The species of this region, about seventeen hundred, are of insignificant economic importance when compared with those of the other two regions. See Arctic Plants.

The intermediate temperate region, which extends from the southern fringe of the Arctic region to the northern limit of the Mediterranean-Caucasian, is characterized first by more varied and numerous perennials, which, as the northern limit recedes, become taller and among which are both shrubs and trees also increasing in size and height; and second, by annual species which also increase in number and variety southward. These species, of which many appear to have migrated westward from Asia, and which are very prolific of seed, quickly take possession of abandoned land, and, being of fairly rapid growth, readily adapt themselves to wide differences of climate, withstanding on the one side the rigors of high latitudes and elevations, and on the other, the droughts of arid sections. In the western part, forests are the dominant feature; in the eastern, steppes. Throughout the whole forest sections of this region, cone-bearing trees predominate. In the far north they exclude all other species of trees, but as the latitude of central Norway is approached, ash, birch, and alder appear. The forest of southern Norway, the Baltic Provinces of Russia, and especially of Denmark, though still largely coniferous, are liberally sprinkled with oak and beech and the three deciduous species mentioned. Throughout Germany and adjoining Russia, France, and Austria, the leading trees are still the conifers (pine, larch, fir), among which the others mentioned are found, mingling with which are elm, maple, acacia, and poplar.

The steppes, not unlike the great western prairies of North America, are treeless plains that extend across the continent from the eastern borders of Holland to and beyond the Ural Mountains. In Russia, where only the name is properly used, these steppes blend with the tundras of the Arctic region, and on the south with the more northerly forests of the Black and the Caspian Sea districts. Since their climate—long severe winter, short vernal season, and protracted parching summer—largely precludes the growth of perennials except along the river-basins, which are often wooded, their flora consists of annuals—grasses on the arable soils, especially north of the Black Sea forests, salt-loving plants in the saline sections north of the Caspian Sea. In the northern part of both forest and steppe districts Arctic species mingle with the hardier temperate plants, in addition to which mustards, parsleys, buttercups, thistles, legumes, crowberries, brambles, bilberries, and their allies are met with in increasing frequency southward. In the southern part, these last-mentioned blend with gorse, shrubby legumes, heaths, lobelias, dianthus, etc., which are most numerous toward the west, while mints, angelica, currants, rhubarb, and their congeners are more abundant toward the east. This region embraces the great agricultural sections of Europe—the vast grain, flax, and grazing areas of Russia; the cereal, root, and hay fields of Germany, Norway, and Sweden; and the general farming sections of Germany, Denmark, Holland, Belgium, the British Isles, and northern France. Except on the remote northern border, grasses and legumes, the bases of successful husbandry, thrive remarkably and materially influence the prosperity of the residents.

The Mediterranean-Caucasian—the fruit, flower, and vegetable—region, which extends from the Atlantic Ocean to the Caspian Sea, thus including all countries on the warm southern border of the continent, is noted for the great diversity and wide economic importance of its flora, which, it is estimated, comprises 85 per cent. of all European species. Annuals and biennials appear in large numbers, the long season of growth favoring their perfect development. The forests are far more mixed than in the other two regions, and contain in addition to the above mentioned species, which appear at greater or less altitudes, evergreen and cork oak, chestnut, sycamore, mountain-ash, plane, and cypress. Of the plants valued for their flowers may be found numerous relatives of the rose, carnation, hibiscus, lilac, tuberose, crocus, lily, colchicum, iris, and many others. In this region more than in either of the others the flora is augmented by exotic species, especially such as have been introduced by man. With the migration of the human race and the extension of commerce westward, useful plants have been purposely carried and useless ones undesignedly transported to regions far distant from their homes. Of such antiquity are many of the Asiatic and African contributions to this flora that many species have become so settled in their new residences as to be considered indigenous. Of these, perhaps the best known are the fig, peach, apricot, walnut, orange, olive, pomegranate, grape, quince, cherry, mulberry, pistachio, melon, leek, onion, sugar-cane, cumin, and cotton. But southern Europe has been not merely a greedy absorber of introduced species; it is a lavish distributer as well. Its trees, fruits, vegetables, and flowers have been carried to every quarter of the globe that European commerce has reached. Save only the plants of Norway's western coast, few in number, but of great adaptability to foreign climates, the species of no other region compare with those of southern Europe as wanderers. So general has been their distribution that no traveler in any country visited by civilized man can go far without meeting plant acquaintances; if not among the useful species, then among the weeds of this Mediterranean-Caucasian region. See paragraphs on flora of the various countries; also Distribution of Plants.

Fauna. The whole of Europe belongs to the Palearctic region of Wallace, but is divided into two subregions, that of northern Europe north of the Pyrenees, Alps, and Balkans, and that of the Mediterranean south of these mountains. The richness of the fauna of central and northern Europe is due to the favorable climatic influences in the west and centre, the physiographic contour of the land, and the rich vegetation, especially that of the forests. On the other hand, the great density of population has much reduced the numbers of the larger animals and has even rendered some species extinct. The characteristic mammals are the bear, lynx, badger, wolf, fox, otter, marten, ermine, polecat, squirrel, marmot, mole, hedgehog, vole, shrew, dormouse, hare, and rabbit; the wild cattle have been almost wholly exterminated by man. (See CATTLE.) Among the species peculiar to this region are the desman and the chamois. The Mediterranean subregion possesses the richest fauna of the European Palearctic region, among the distinctive mammals being the fallow deer, ibex, Alpine marmot, and civet. This fauna extends also along the south shore of the Mediterranean as far as the Atlas Mountains; and this northwest corner of Africa and the Ægean Islands contain a few species, like the wild sheep, not now known in Europe, but properly a part of its fauna.

The apes are not found in Europe save for a species of macaque in the neighborhood of Gibraltar, which is more nearly allied to the Asiatic simians than to the African. The bats, cats, dogs, martens, deer, hares, and mice are found throughout Europe. The hedgehogs are not found north of latitude 60° except in Scandinavia, where they range a few degrees higher. The moles are found between latitudes 44° and 60° N., and also range a little higher in Scandinavia. The otters and badger-like animals are found little above the Arctic Circle. The bears are not found in the extreme west, though formerly inhabiting nearly the whole of France and the British Isles. The dormice are found in western Europe as far north as the 60th parallel, but in eastern Europe not above latitude 50°. The squirrels are found throughout Europe except at the extreme north, and the beavers south of latitude 65°, but not in the extreme west and not below the Alpine region. Swine are found south of 60°.

Of the birds, the most characteristic are the thrushes, sylvine warblers, tits, pipits, wagtails, finches, snow-buntings, house-sparrows, crossbills, linnets, magpies, choughs, kingfishers, goat-suckers, wood-pigeons, grouse, and ptarmigans. Of the larger birds may be mentioned the eagles, falcons, owls, and ravens. Many of the numerous birds found in this region are annual migrants from the south.

Reptiles are comparatively scarce, there being found but 14 species of snakes and 12 of lizards. Only one North European serpent is venomous. Of the amphibians, several forms are peculiar to this region, among which are the eel-like proteus, the curious toad (Alytes), the male of which carries the eggs until they are hatched, and the Pelodytes, a frog peculiar to France. Frogs, toads, tree-toads, and newts are common.

The characteristic fresh-water fish are the sticklebacks, perch, sheatfish, pike, carp, gudgeon, roach, chub, dace, tench, bream, bleak, loach; and among sea-fish several species not known on the American shores of the Atlantic, of which the tunny and sole are most conspicuous.

Insects are numerous, butterflies especially being very abundant, and the species widely spread, but no genera are peculiar to the region. This region is also rich in beetles and other insect forms.

HISTORY.

EARLIEST POPULATION. Of the peoples that have inhabited Europe since the dawn of history, some — and these the most important, Greeks, Italians, Celts, Germans, and Slavs—exhibit striking resemblances in language and in their early religion and customs. Other peoples, like the Iberians, who inhabited what is now Spain, the Etruscans, who inhabited northern Italy, and the Lapps and Finns, who still occupy the extreme north of the continent, apparently had from the outset dissimilar speech and customs. The resemblances noted between the peoples of the first group exist also between them and the Indo-Iranian peoples of Asia. From these data philologists have inferred that all these peoples are members of a single race, which they term the Aryan race; and since, in historical times, the Celts, Germans, and Slavs have been pressing westward, it is assumed that the original home of the Aryan race was in Asia. Modern ethnological researches, however, are tending to modify the Aryan hypothesis. On the basis of a comparison of physical characteristics, especially of skull-forms, it is asserted that the original population of Europe consisted of two races, which are termed Eurafrican and Eurasian, and that the former race was originally located in the basin of the Mediterranean, the latter in the valley of the Danube or even farther east. Of the Eurafrican race two branches are found, one of which continued to live on the Mediterranean, while the other went or was driven into northern Europe (the so-called Baltic branch). It is further asserted that the so-called Aryan peoples of Europe exhibit, for the most part, such a mixture of these two racial types that the resemblances which have heretofore been taken as proofs of common origin seem rather ascribable to the diffusion of the speech, religion, and customs of some superior people, partly by expansion and conquest, partly by imitation. See ARYAN; INDO-EUROPEANS; EUROPE, PEOPLES OF.

EARLIEST CIVILIZATION. In the earliest times of which we have historic knowledge, only those parts of Europe which border upon the Mediterranean were in any sense civilized, and the points at which a Mediterranean civilization first appeared were Egypt and Phœnicia. There is increasing evidence that the civilization of these countries was of Asiatic origin. It probably came along the routes of trade from Assyria (perhaps ultimately from China), and its diffusion through the Mediterranean Basin was accomplished chiefly by the earliest traders in that sea, the Phœnicians. It was in Crete, where the Phœnicians had some of their earliest trading posts, that a Greek civilization seems first to have developed. See EGYPT; PHŒNICIA.

GREEK CIVILIZATION. Before the conquest of Greece by the Romans (B.C. 146), the Greeks had developed every form of government which Europe has since known. Their little city States passed from patriarchal kingship to aristocracy and from aristocracy through tyranny to democracy. In the struggle of their leading States for predominance, as on the larger theatre of Europe 2000 years later, a refined diplomacy, solicitous to maintain the balance of power, knit and dissolved alliances; and when, weakened by these internal conflicts, Greece was subjected to the military monarchy of Macedon, an era of imperialistic expansion began. In art and in letters this precocious people similarly anticipated every form of expression which European civilization has since employed; and Greek builders, sculptors, poets, and orators produced masterpieces that have not been surpassed. In philosophy also the Greeks have foreshadowed, if they did not anticipate, all the chief tendencies of modern thought. By colonization the Greek civilization was extended to Asia Minor, Sicily, southern Italy (*Magna Græcia*), and many other points in the Mediterranean. By the conquests of Alexander the Great, it became dominant in Egypt and southwestern Asia. As far as Europe was concerned, the only lands which the Greeks brought into closer touch with Mediterranean civilization were those bordering on the Black Sea. In that sea the Phœnicians had had trading posts, but the Greeks founded colonies and built cities. A trade route was gradually established between the Black Sea and the Baltic, and the direct influence of the Greek civilization upon eastern Europe did not cease until Constantinople was captured by the Turks (A.D. 1453). See GREECE; GREEK ART; GREEK LITERATURE; GREEK PHILOSOPHY.

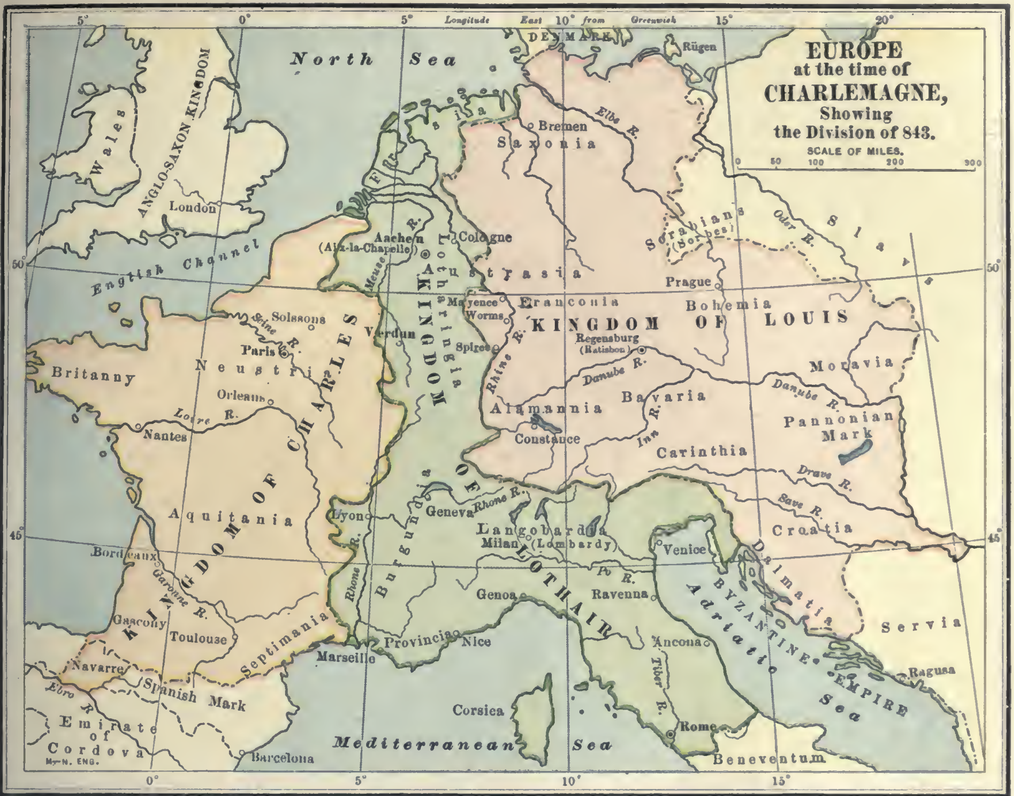
ROMAN CIVILIZATION. Inferior to the Greeks in alertness of mind and in versatility, but superior in poise and in judgment, the Romans slowly developed a civilization of a higher type in matters of government and law. They first devised a working combination of power and freedom. In the third century B.C. Rome had made herself mistress of Italy; and when, in the struggle with Carthage (q.v.), she added sea-power to her land-power, she was able to extend her authority over the entire basin of the Mediterranean. After the conquest of Greece (A.D. 146) the Greek culture became dominant at Rome in art, letters, and philosophy; and the civilization which the Roman Empire carried into lands heretofore barbarous was a Græco-Roman civilization. In the eastern portion of the Empire, the direct influence of Greece was naturally greater; in the western portion, that of Rome. In western and central Europe the Greek culture was introduced and perpetuated, until the fourteenth century, mainly through the Latin imitations of Greek forms and Latin popularizations of Greek thought. The third great force that has shaped the modern world, Christianity, was sensibly affected by Greek thought and Roman institutions. Paul and the early Fathers, trained in the learning of the Greeks, put the doctrines of the new religion into the form best adapted to appeal to the Græco-Roman world; the formulation of its dogmas was sensibly influenced by Roman legal ideas; and the hierarchic organization with which the Christian Church came into mediæval Europe was modeled on the administrative system of the Roman Empire. If it is broadly true, as Maine has said, that the modern civilized nations are those that derive their law from Rome, their art from Greece, and their religion from Judea, it is also true, as Freeman has said, that "of all European history Rome is the centre;" for the Roman Empire summed up the chief results of the ancient civilization and transmitted them to the modern world. See ROME; CHRISTIANITY; CIVIL LAW.

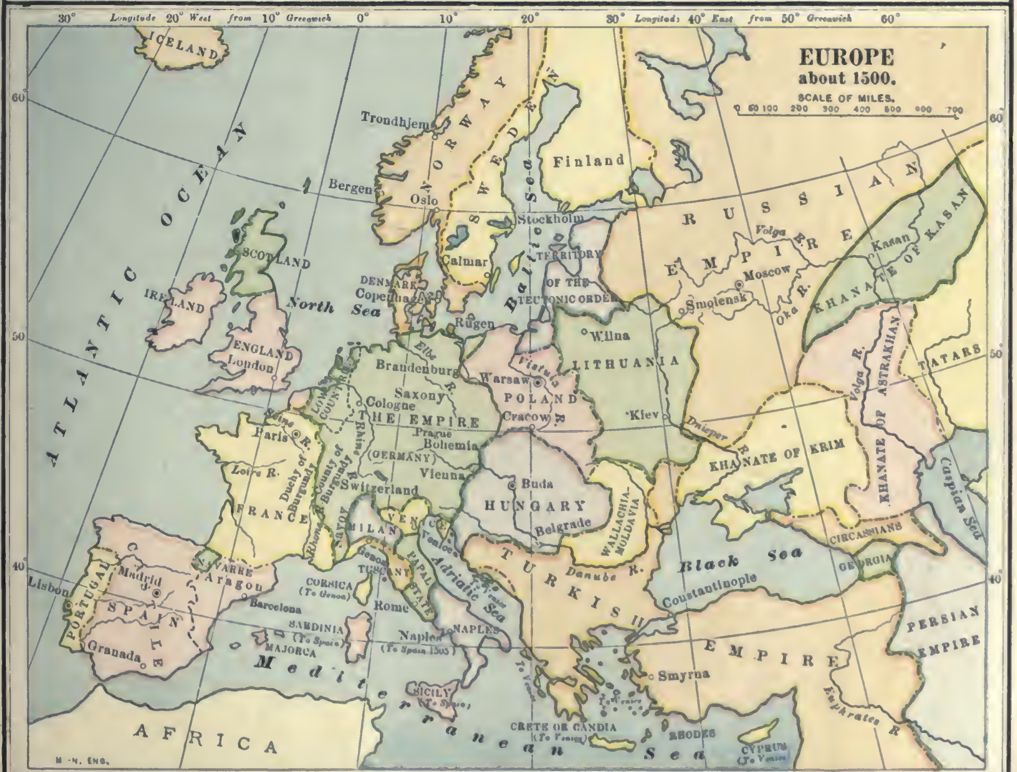
EUROPE UNDER THE ROMAN EMPIRE. Under Augustus the Roman Empire attained the boundaries which it successfully defended for four centuries. (See Map of the Roman Empire, under ROME.) In Europe these were the Rhine and the Danube, and the territory between the upper courses of these rivers. In only two directions was there subsequent expansion. During the first century the greater part of Britain was subdued; and at the beginning of the second century the territory beyond the Lower Danube, Dacia (modern Rumania), was organized as a province and held for 170 years. Military roads and fortified camps not only facilitated the defense of the Empire, but stimulated trade and the growth of cities. Except in the most mountainous regions, the barbarians whom Rome had subjugated gradually accepted the Græco-Roman civilization. In Spain and Gaul and in the British cities Latin supplanted the native languages. From the close of the first century the provinces supplied the Empire with the majority of its civil and military officers and with nearly all its emperors. Through this increasingly homogeneous empire the Christian religion made rapid progress; and when, in the fourth century, Christianity became the State religion, the provincials accepted that creed which had finally obtained the recognition of the Imperial Court—the creed formulated by Athanasius (q.v.). Of the barbarians beyond the Roman borders, the nearest and most dangerous were the Germans. The almost incessant conflicts which were necessary to hold the line of the Rhine and the Danube forced Rome steadily further into military monarchy, until, under Diocletian, the Empire was reorganized on lines which contemporaries regarded as 'Persian.' The burden of a great standing army, bad management of the Imperial finances, and an elaborate system of State socialism impoverished the Empire, and its native population diminished. In order that the soil might be tilled and the legions kept at full strength, barbarians, especially Germans, were imported in increasing numbers. At the time of Augustus the population along the west bank of the Rhine was substantially German. In the following centuries German captives were settled in Britain, in Gaul, in Italy, and in the Danubian Provinces, at first as serfs, after the close of the third century as tributary communities. From these and from tribes across the frontier in alliance with Rome, an increasing proportion of recruits was drawn, until, in the fourth century, the legions settled on the frontier were largely composed of Germans. After Constantine, Germans rose to the highest positions in the army and the central administration, and "the last century of Roman history may boldly be characterized as the century of German rule" (Brunner). Upon the Germans beyond the frontier the most important effect of these centuries of conflict was the gradual formation of those larger tribal unions which, in the fifth century, overthrew the West Roman Empire and divided among them its provinces. The tribes in closest contact with Rome were converted to Christianity in the fourth and fifth centuries. The missionaries who accomplished this work were followers of Arius (q.v.), and the Germans retained the Arian creed after the Emperors and the Church councils had accepted that of Athanasius.

THE BARBARIAN KINGDOMS. It was the beginning of the end of the old order when, at the close of the fourth century and the beginning of the fifth, whole German tribes were settled within the frontier as allies of Rome, on the condition that they should hold back the tribes behind them. The incursions of the Huns (q.v.), which threw eastern and central Europe into confusion, hastened the destruction of the Empire. In the fifth century the frontier was lost; the Germans and the Huns broke through all along the line. (See MIGRATIONS.) At the close of the fifth century, Saxons, Angles, and Jutes had established kingdoms in eastern and southern Britain; Gaul was divided between Franks, Burgundians, and Visigoths; Spain between Visigoths and Suevi; northern Africa and the islands of the western Mediterranean were occupied by Vandals; and Italy, where a German leader of mercenaries (see ODOACER) had deposed the last West Roman Emperor, had passed, with all the territory between the Middle Danube and the Adriatic, under the rule of the Ostrogoths. (See BURGUNDIANS; GOTHS; SUEVI; VANDALS; etc.) To the Roman provincials (except in Britain) the change of conditions must have seemed slight. They had often been ruled by German officials, and the German kings who now ruled them held official titles conferred by the Emperor at Rome or the Emperor at Constantinople. The Romans remained free, and in their disputes with each other they were still governed by Roman law. The Burgundian and Visigothic kings caused manuals of Roman law to be compiled for the benefit of their Roman subjects. Theodoric (q.v.), King of the Ostrogoths, issued a similar compilation, by which Goths as well as Romans were to be governed. Each provincial landholder was, indeed, compelled to surrender to a German a part of his estate and slaves; but under the Empire German soldiers had been quartered on the provincials, and contributions had been exacted for the support of the soldiers. From such contributions the Romans were now freed. The chief cause of friction between the German kings and their followers on the one hand and the Roman provincials on the other lay in the fact that the former were generally Arian heretics. The resultant disaffection was a serious element of weakness in the kingdoms of the Goths, Burgundians, and Vandals. Early in the sixth century the newly converted and orthodox Franks defeated the Visigoths and the Burgundians, and brought under their control all Gaul except the Mediterranean coast. (See CLOVIS; FRANKS.) Later in the same century the armies and fleets of the orthodox Justinian overthrew the kingdoms of the Arian Vandals and Ostrogoths and wrested southeastern Spain from the Visigoths, so that for a few years the Mediterranean was again Roman. (See JUSTINIAN; BELISARIUS; NARSES.) Before the close of the century the Visigoths and the Suevi, whose realm the Visigoths had annexed, abjured their heresies, and in Visigothic Spain the clergy became all-powerful. In 568 the Arian Longobards, or Lombards (q.v.), conquered northern and central Italy, but this tribe also accepted the orthodox faith in the middle of the seventh century. The scattered settlement of the German conquerors among their Roman subjects favored a fusion of races, and the chief obstacle to fusion disappeared when the Germans became orthodox Christians. Of all the kingdoms founded by the Germans on Roman soil, that of the Franks became the most powerful and proved the most durable, because the Franks retained, as the central point of their power, their old home on the Lower Rhine, and because the expansion of their rule over Gaul and later over Italy was accompanied by expansion over purely German territory. At the close of the fifth century the Franks conquered the Alemanni, and in the sixth the Thuringians and Bavarians.

THE ARABS. In the seventh century Christendom was forced into a struggle for existence against the hordes of Arabia and of Africa, fused into a fighting unit by a new religion—Mohammedanism. Within a generation after the Hejira (A.D. 622) the Arabs had destroyed the kingdom of the Sassanides in Persia, had wrested from the Greek Empire Syria and Egypt, and were overrunning North Africa. Before the close of the century they were besieging Constantinople. The Greeks, though hard pressed by Asiatic hordes north of the Balkans, nevertheless beat off the Mohammedan attack and maintained their hold on Asia Minor. Early in the eighth century the Arabs, now in complete control of northern Africa, defeated the Visigothic forces (A.D. 711), and conquered all Spain except the mountainous northern regions. Pressing into Gaul, they were beaten back by the Franks in 732.

THE FRANKISH EMPIRE AND THE PAPACY. The great German-Gallic kingdom which the Franks had built up in the fifth and sixth centuries was threatened, in the seventh century, with dissolution. The royal power was hereditary, but all the sons of the King had equal rights of inheritance. The resulting partitions were indeed temporary; by wars and by murders the realm was repeatedly reunited; but in these struggles the territorial magnates gained increasing independence, while the degeneracy of the reigning house diminished its authority. (See MEROVINGIANS.) The power that was slipping from the hands of the Merovingians was, however, grasped by new rulers, Arnulfings or Carolingians (q.v.), who, first as mayors of the palace, later as kings, reëstablished the royal power, and in the eighth century widened the Frankish kingdom into a European empire. As in the earlier stages of Frankish expansion, the acquisition of new Romanic territory (Italy and northeastern Spain) was balanced by conquests of other German tribes (Frisians and Saxons). Even more than the Merovingians, the Carolingians identified their dynastic interests with those of the orthodox Christian Church. They carried the Gospel among the heathen Germans with the sword, converting as they conquered. They drove the Arabs back across the Pyrenees (see CHARLES MARTEL and PEPIN THE SHORT), and extended the boundary of Christendom to the river Ebro. Throughout their realms, they enforced the claim of the Bishop of Rome to supreme authority in matters of ecclesiastical discipline; and when they interfered to protect him against the Lombards they recognized him as ruler over a strip of central Italy, reaching from Ravenna to Rome, and thus laid the basis of the temporal power which the popes held until 1870. (See DONATION OF PEPIN; STATES OF THE CHURCH.)





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The sovereignty of the Emperor at Constantinople, which the bishops of Rome had theretofore recognized, was from this time denied. (See PAPACY.) In return for their services to the Church, the Carolingians received aid from the popes in political matters. The Papacy helped to transform Pepin from mayor of the palace into king (A.D. 752), and Charles the Great from King of the Franks and the Lombards into Emperor of the Romans (A.D. 800). The tradition of the Roman Empire, the idea that all Christians should be subject to one secular lord, the Emperor, was still a force; and when Charlemagne had made himself supreme in the Western Christian world, and the Imperial dignity had passed at Constantinople to a woman (Irene), it seemed to Western Christendom a natural thing that its ruler should be recognized as the successor of the Roman Cæsars. Through the harmonious coöperation of Church and State, in the empire of Charlemagne, the political, religious, and literary influences that had come down from the ancient world were for the last time focused; and from the Frankish Empire these influences were transmitted, with certain permanent modifications, to the new and separate nations which took its place. Of the new institutions that took shape in the Frankish Empire the most important was feudalism. Feudalism had many roots, some of them Roman; but the feudal system obtained its definite legal basis when Charles Martel, in order to meet the Arab horse with Christian cavalry, began to give benefices on the tenure of knight-service. The knight-fees which he created were, to a large extent, carved out of Church lands; and thus the Church was drawn into the feudal system. See CHARLES THE GREAT; FEUDALISM.

EUROPE AT THE TIME OF CHARLEMAGNE. (See Map, EUROPE AT THE TIME OF CHARLEMAGNE.) The empire of Charles the Great included all Christian Europe except the British Islands, where the German invaders had been converted in the seventh century; northwestern Spain, where Christian chieftains of Gothic or Suevic blood were holding out against the Arabs; and the Greek Empire. The Danes and Scandinavians on the north, the Slavs and Avars on the east were still heathens. The Frankish Empire included all the German tribes of central Europe; but it did not include all the territory of modern Germany, since its northeastern frontier ran between the Elbe and the Oder. The only other European powers were the Greek Empire and the Emirate of Cordova. The territory north of the Balkans had fallen into the hands of Slavic and Asiatic hordes (Servians and Bulgarians); but the Emperor at Constantinople still ruled the rest of the Balkan Peninsula, together with southern Italy, the principal islands of the Mediterranean, and the greater part of Asia Minor. The Greeks still had sea-power, and the trade between Europe and the Orient was mainly in their hands. Until after the crusades their coin, the 'besant,' was the standard of Mediterranean values. South of Christendom, from Spain through North Africa to Syria, curved the crescent of Islam. In the West, where the emirs of Cordova had made themselves independent of the caliphs at Bagdad, Mohammedanism had reached the limit of its forward movement; but in the islands of the Mediterranean, in Asia Minor, and in southeastern Europe it was still to win ground from the Greeks. Placed in touch with the Greek civilization in Syria and in Egypt, Islam was developing, in letters and in science, a culture which, until nearly the close of the Middle Ages, was superior to that of western Europe. See SARACENS.

DISSOLUTION OF THE FRANKISH EMPIRE. BEGINNINGS OF THE MODERN EUROPEAN NATIONS. The power of Charles the Great's successors was undermined by the growing independence of the local magnates, particularly of those who held the offices of count or of margrave. These offices, as well as the domains that went with them, were coming to be regarded as fiefs, and, like other fiefs, were becoming hereditary. Some magnates whose feudal authority extended over many countries were coming to be called dukes. In the German territories some of these dukes ruled whole tribes, like the Bavarians and the Saxons, and were in a sense successors of the tribal kings whom the Franks had suppressed. The great prelates, too, were becoming independent, and in many cases bishops and abbots received the secular powers of counts. The Empire was weakened also by the attacks of Slavs and other barbarians on its eastern frontier, of Arabs in Italy, and of Scandinavian pirates on all its coasts. The immediate cause, however, of the disruption of the Empire was the right of all the sons of the Frankish King to succeed to the royal authority. In order to maintain as far as possible the unity of the Empire, a compromise was proposed: Arrangements were made by which each son should receive as King a part of the Empire, but a larger part with a superior authority should go to the eldest son as Emperor. Wars followed, and in these the old Frankish principle triumphed. In 843 the Empire was divided into three approximately equal shares. (See VERDUN, TREATY OF.) Although this division lasted but twenty-seven years, the name of the middle kingdom, Lotharingia, still survives in the modern Lorraine. Some forty years after the partition of Verdun, all the Carolingian territories were for a short time reunited under Charles the Fat; but after 887, when Charles the Fat was deposed, France and Germany were permanently separated; there were two independent Burgundian kingdoms and there was a separate but not a united Italy. In the north of Italy there were kings, some of whom were crowned emperors; in the middle were the possessions of the Papacy; in the south Lombards, Greeks, and Arabs were fighting for supremacy. In France and in Germany descendants of Charles the Great reigned for a time; but in the tenth century other kings, not of the Carolingian stock, were set up by the territorial magnates. Of these new kingdoms Germany was by far the strongest. The Norse pirates were beaten off from its coasts, and the Danes were pushed back into Jutland. The Hungarians, who had kept central Europe in turmoil during the first half of the tenth century, were defeated and confined to the territory which they still occupy. The Slavic kingdom of Poland recognized German suzerainty; the Slavic peoples of Bohemia and Carinthia were incorporated into Germany. The debatable land to the west of the Rhine (Lorraine) and the greater part of Italy were brought under the overlordship of the German kings in the tenth century; Burgundy was annexed in the eleventh. With the reëstablishment of German authority in Italy (962) the German kings assumed the Imperial title. See HOLY ROMAN EMPIRE.

Second only to Germany's influence during these centuries was that of the Scandinavians. In the latter half of the ninth century the Swede Rurik established among the eastern Slavs the kingdom which became Russia, and the Danes conquered nearly half of England. In the tenth century the Norsemen obtained possession of a part of northern France, founding there the Duchy of Normandy. In the first half of the eleventh century the Danish King Cnut reigned for a few years over a northern empire which included all England and the greater part of Scandinavia; and England escaped from the rule of the Danes only to fall, within a score of years, under that of the Normans. In the same century wandering Norman knights gained control of southern Italy and Sicily. (See NORMANS; VARANGIANS; GUISCARD.) Of all the national States that were in process of formation at the close of the eleventh century, England alone had a strong central government, and this only after the Norman Conquest. France and Germany each had a king, but the king was only the first among his peers; the real power was in the hands of the great nobles and prelates. The same was true in Italy, and in the Christian States that were taking form in northern Spain; and in neither of these countries was there even the nominal unity of a single national kingship. In Spain and in Italy, however, as in France, separate and fairly homogeneous nationalities were developing. Goths and Franks, Burgundians and Lombards had intermarried with the Roman provincials and had adopted their speech; and on the basis of the vulgar Latin of each province, new national languages had already been formed. The Scandinavian conquerors also, who came five centuries later, lost their racial identity and became French in France, Italians in Italy, Slavs in Russia. In all the larger countries of western and southern Europe, however, there were marked local differences in dialect and in customs, and broader differences between the northern and southern districts. In general, throughout the Middle Ages, national feeling was weak. The strongest ties were those of locality and of class, and the classes were not national, but European. At the close of the eleventh century the peoples of northern and eastern Europe were coming under the influence of Christian civilization. The only important regions not already reclaimed from heathenism at the end of the century were those south and east of the Baltic, inhabited by Pomeranians, Prussians, Lithuanians, Livonians, etc. The Scandinavians, the Western Slavs (Poles and Bohemians), and the Hungarians received Christianity from the Roman Church, and were thus drawn into the West-European body of nations. The Servians, Bulgarians, and Russians, on the other hand, were converted by Greek missionaries, and constitute to this day, with the Greeks, a distinct East-European group.

INCREASING POWER OF THE CHURCH. After the disruption of the Frankish Empire the unity of Western Christendom was visibly represented only in the Roman Church. The Church had loyally supported the Empire, and had striven to avert its destruction. When this became inevitable, the Church naturally secured as much as possible of the Imperial inheritance. The unity for which it stood was in no wise confined to matters of faith and worship. The Church represented the learning of the age, and had complete control of education. It was the exclusive recipient and administrator of charitable trusts; it alone cared for the sick and infirm and relieved the poor. It interpreted and enforced by penalties the rules of morality, and by reason of the intimate connection between morals and law, and between its sacraments and the whole social life, it exercised a somewhat indefinite but very wide jurisdiction over matters which are to-day regarded as legal. (See CANON LAW.) To this jurisdiction every Christian was subject, from the peasant to the King. The Church thus discharged many governmental functions which the mediæval State was too crude and too feeble to undertake. It was in reality an ecclesiastical State, and it possessed a governmental organization and a governmental personnel far superior to that of any contemporary secular State. For the efficient discharge of its duties the Church deemed it necessary that its agents, from Pope to parish priest, should be independent of the secular powers. It had succeeded in exempting its clergy from secular jurisdiction, but it had not obtained full freedom in the selection of its officials. The Pope, as Bishop of Rome, was chosen by the clergy and people of Rome. In the tenth century the Roman nobles controlled the Papal elections, and the character of the popes whom they selected was such as to deprive the office of much of its dignity and authority. In the eleventh century the German emperors brought about a reform; they secured the deposition of unworthy popes and the election of worthy German successors; but this Imperial interference was a fresh menace to the independence of the Church. The local authorities of the Church, the bishops and the abbots, were likewise elected by the clergy of the cathedral chapters and of the monasteries; but the lands of the Church were fiefs and the prelates feudal vassals, and the secular overlord naturally endeavored, and usually with success, to control the election of these authorities. The attempt of the greatest of the German popes (Gregory VII.) to deprive the feudal superior of all influence upon the choice of bishops and abbots brought the Papacy into conflict with the German emperors. In this conflict the emperors were supported by the German prelates whom they had practically appointed, while the popes were supported by the secular princes of Germany, who desired to weaken the Imperial power at home. (See INVESTITURE; GREGORY VII.; HENRY IV.; SAXON EMPERORS; PAPACY.) The terms on which the conflict was ended (Concordat of Worms, 1122) did not fully realize the Papal aims. In the eleventh century, however, the basis was laid for the greatly increased power which the Church exercised in the thirteenth century. The selection of the head of the Church was intrusted to a body created by the head of the Church, the College of Cardinals. The interest of the feudal superior in the control of Church elections was diminished by renewed prohibition of the sale of ecclesiastical preferments (simony), and by making it more difficult for those prelates who bought preferment to keep it. Finally, the renewal and enforcement of the rules prohibiting the marriage of the clergy secured for the Church a body of servants removed as far as possible from all influences except her own. (See CELIBACY.) From the eighth century, when the bishops of Rome denied the temporal sovereignty of the Emperor at Constantinople and began to assert a spiritual authority which the Eastern branch of the Church was not disposed to recognize, the Roman and the Greek churches had drifted apart. The separation became definite and final, in the eleventh century, in consequence of a doctrinal difference concerning the Procession of the Holy Ghost. The Eastern Church never became independent of the secular authority, and its dependence facilitated the development of national churches. See BYZANTINE EMPIRE; GREEK CHURCH.

AGE OF THE CRUSADES. Except in Spain, where the Kings of Leon had gradually reconquered a fourth part of the peninsula, Christian Europe had remained for nearly three centuries on the defensive against Islam. In the eleventh century a new and ruder people, the Seljuk Turks, became dominant in Mohammedan Asia, maltreated Christian pilgrims, and conquered Asia Minor (1071). At the appeal of the Greek Emperor, Pope Urban II. called Christian Europe to arms (1095); and before the close of the century a great host of crusaders had marched through Asia Minor and occupied Syria, establishing there a kingdom of Jerusalem and other principalities. (See CRUSADES.) The struggle thus opened continued for two centuries. The retainers of the Christian princes in Syria and the military monks (see HOSPITALERS; TEMPLARS; TEUTONIC KNIGHTS) constituted the standing army of the Christians; repeated crusades from all parts of Europe brought volunteer assistance. The struggle ended at the close of the thirteenth century with the evacuation of Syria by the Christians. An episode of the Crusades was the temporary overthrow of the Greek Empire (1204) by French crusaders in alliance with Venice. A Flemish count (see BALDWIN I.) was made Emperor at Constantinople, and the European territories of the Empire were assigned to French kings and dukes or to the Doge and Commune of Venice. The Greek emperors, meanwhile, continued to reign in Asia Minor; and in the latter half of the century, with the aid of the Genoese, they recovered Constantinople (1261) and the greater part of their former possessions. The Venetians, however, kept much of the territory they had acquired, and became the leading commercial power in the eastern Levant; although the Genoese, on better terms with the Greeks, had control of trade in the Black Sea. The only permanent gains made by Christendom during these centuries were in Spain and on the Baltic. War against the heathen in these places also was regarded as a crusade. By the middle of the thirteenth century the Christians had conquered all of Spain except Granada; the Teutonic Knights had subdued and converted the Prussians; and another body of military monks, the Brethren of the Sword, were doing the same work in Livonia and Esthonia. In this same century, however, Christendom lost ground in eastern Europe through the conquest of Russia by the Mongols (q.v.).

THE PAPACY AND THE WESTERN EMPIRE. During these centuries the Papacy, on which naturally devolved the leadership of Christendom in the warfare for the Cross, attained its greatest power. The popes made and deposed emperors and kings, accepted whole kingdoms as fiefs of the Church, and exercised jurisdiction in international controversies. The German emperors of the House of Hohenstaufen (1138-1254) seemed indeed almost as powerful as their predecessors of the eleventh century, who had made and unmade popes; and when by marriage the emperors gained control of the Norman kingdoms of Naples and Sicily, the independence of the Papacy appeared to be seriously menaced. Among the German princes, however, and in the Lombard cities the popes found trustworthy, because interested, allies; and a century of intermittent conflict ended in the destruction of the Hohenstaufen dynasty. See GUELPHS AND GHIBELLINES; HOHENSTAUFEN.

EUROPE AT THE END OF THE CRUSADES. At the close of the thirteenth century Germany and Italy had become aggregations of practically independent principalities, secular or ecclesiastical, and of free cities. Kings were elected in Germany, and these kings called themselves Roman emperors; but they had almost no power in Italy and little in Germany. Poland and Hungary were no longer even nominally subject to the empire, and Burgundy was drifting to France. In the northeast, however, Germany had expanded by Saxon conquests and colonization, and the gains thus effected proved more durable than those made by the military monks. The kings of England had retained Normandy through the twelfth century, and had acquired by marriage so many other French fiefs that they ruled half of that kingdom; but all these possessions except Guienne had been lost by the unlucky John early in the thirteenth century. In France, as in England, the crown had become hereditary, and at the close of the thirteenth century the power of the French kings was increasing. In Spain the united kingdom of Leon-Castile, (in which also the royal power was increasing) covered the greater part of the peninsula; but Portugal, independent since 1139, had attained its present boundaries, and all eastern Spain was ruled by the King of Aragon. During these centuries there was a sensible increase of commerce in western Europe. The control of European trade with the East passed out of the hands of the Greeks into those of the Italians, and a much more active traffic was developed on the trade routes between the Mediterranean and northern Europe, especially on those that ran through Germany. The result was a great increase in the wealth and power of the cities, first in Italy, later in Germany, France, and Spain. Everywhere the citizens bought or fought themselves free from their ecclesiastical or secular lords; in many parts of Europe the cities formed alliances for mutual protection. The league of the Lombard cities played an important part in the struggle between the popes and the emperors; the great league of the Hansa, which soon controlled the trade in the northern seas, was formed at the close of the thirteenth century. (See HANSEATIC LEAGUE.) It was a natural result of the increasing importance of the cities that their representatives were summoned to meet with the other estates of the realm in diets or parliaments. This occurred in the Spanish kingdoms in the twelfth century, in England and in Germany in the thirteenth century, and in France in the fourteenth century. In the intellectual life of Europe the universities played an increasingly important part. The age of the Crusades was also the age in which scholasticism reached its highest development. It was also the age in which the study of the law-books of Justinian was revived, and in the legists a new learned class appeared from which the kings and princes, heretofore dependent upon the clergy for their administrative officials, were able to draw servants wholly devoted to their interests. The cities furnished the wealth and power which in the following centuries made monarchy independent of the feudal nobility; the legists formulated the theories and furnished the trained service which was to make the modern State independent of Pope and Church.

CHANGES DURING THE FOURTEENTH AND FIFTEENTH CENTURIES. The consolidation of France was interrupted by a series of wars, in which the English kings strove to make themselves kings of France also. (See HUNDRED YEARS' WAR.) In the fifteenth century, in alliance with Burgundy, Henry V. of England came near accomplishing this end. The French dukes of Burgundy had obtained control of the Netherlands, and aimed to establish an independent middle kingdom. (See BURGUNDY.) In 1435, however, Burgundy made peace with France, and within a score of years England had lost all its conquests except Calais. After the death of Charles the Bold of Burgundy, in conflict with the Swiss (1477), the greater part of the Netherlands passed, by marriage, to the Austrian House of Hapsburg, but Burgundy was annexed to France. By the union of Castile and Aragon (1479), and the conquest of Granada (1492) and of Spanish Navarre (1512), Ferdinand the Catholic became ruler of the entire Spanish Peninsula, except Portugal. Thus France and Spain came out of the Middle Ages as well-rounded national States. In each the crown was hereditary and the royal authority was becoming supreme. In central Europe the conditions were very different. In Germany the emperors were chosen first from one house and then from another, that no precedents for hereditary succession might be created; and each emperor used his position to increase the territorial power of his own house. After 1438, indeed, emperors were regularly taken from the Hapsburg family, but this change of policy indicated only that the other territorial princes had become too strong to apprehend any revival of the Imperial power. Thus weakened, the Empire began to lose territory on every side. In the fourteenth century the Swiss became practically independent of the Empire; in the fifteenth they became a factor in European politics. In the latter century Burgundy passed definitively to France; Schleswig and Holstein were brought into personal union with Denmark; and the Prussian possessions of the Teutonic Order were partly annexed by Poland and partly held as fiefs from the Polish Crown; Italy remained divided, for it was the policy of the popes to prevent any single State from obtaining a predominance which would threaten the independence of the Papal States. The wealth and weakness of Italy naturally attracted the stronger Western States. Since the overthrow of the Hohenstaufen, Aragonian princes had ruled in Sicily, and French princes at Naples. In the first half of the fifteenth century Aragon obtained control of both regions. Before the close of the century Charles VIII. had invaded Italy to enforce the French claims to Naples, and the struggle for the control of the peninsula was opened. In the north and east of Europe, as in the west, larger political unions were forming. At the close of the fourteenth century all the Scandinavian countries were brought by the Kalmar Union under a single ruler, and Norway remained united with Denmark until 1814; but Sweden was largely independent during the fifteenth century, and became wholly independent in the sixteenth. In the latter part of the fourteenth century Poland was united with the recently Christianized Lithuania, and became, in territorial extent at least, an important State, stretching from the Baltic to the Black Sea; but the elective Polish monarchy never developed sufficient power to make this Slavic State permanent. At the close of the fifteenth century Russia freed itself from subjection to the Mongols. The most important event of this period, however, was the overthrow of the Greek Empire. In the middle of the fourteenth century the Ottoman Turks, having subdued Asia Minor, attacked the European territories of the Empire; before the end of the century they had conquered nearly all of the Balkan Peninsula, and in 1453 they took Constantinople by storm. Long decadent, the East Roman Empire had, nevertheless, outlived the West Roman for nearly a thousand years; and it had held against Islam the southeastern gate to Europe for more than seven centuries. (See Map: EUROPE ABOUT THE YEAR 1500.)

CLOSE OF THE MIDDLE AGES. Intellectually and spiritually, the closing centuries of the Middle Ages represented ferment and growth. Renewed acquaintance with the literature of the ancient world (see HUMANISM) widened the narrow horizon of mediæval thought. The invention of printing immensely accelerated the diffusion of new ideas. The basis of political power also was shifted. The invention of gunpowder completed the change begun by English bows and Swiss pikes; it destroyed the military superiority of the armored horseman and the power of the feudal nobility. The opening by the Portuguese of the sea route to India, and the discovery, under the auspices of Spain, of a new world in the West, signified primarily for modern Europe the opening of new sources of wealth, and an increase of the power of the burgess class and of the Crown. Later it was to signify the expansion of European civilization over the world; and, last of all, the subordination of European politics to world politics. At the close of the thirteenth century the power of the Papacy had begun to decrease. England and France were already asserting, as other countries were later to assert, the right of the State to limit ecclesiastical jurisdiction and taxation and the taking of land into the 'dead hand.' (See MORTMAIN.) Early in the fourteenth century the French kings brought the Papacy under their control, and for seventy years the popes were in exile at Avignon. Other popes were set up at Rome. The schism was ended by Church councils in the fifteenth century, but reforms proposed by the councils were not carried into operation. Reformation through revolt found its leaders in Wiclif and Huss, and the attempt to crush the Hussite revolt led in the fifteenth century to a long and bloody war. See WICLIF; HUSS; HUSSITE WARS.

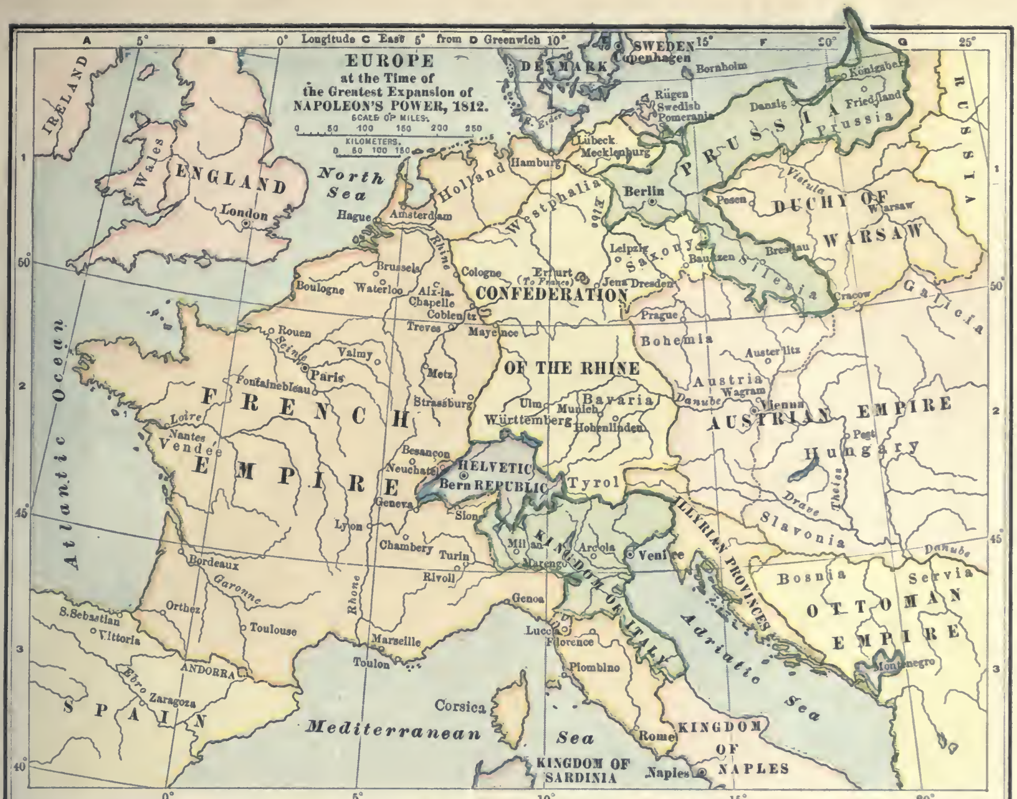
THE PERIOD OF THE REFORMATION AND THE RELIGIOUS WARS. The struggle between France and Spain for supremacy in Italy may be regarded as the beginning of the modern period of international politics. The Reformation (q.v.), by completing the disintegration of the Holy Roman

Empire and dismembering Germany, made this country, too, a plaything for the ambition of other powers; it shifted the centre of European intrigue and conflict from southern to northern Europe. The expansion of firmly governed nations at the expense of nations lacking a strongly centred authority is perhaps the most marked feature of the succeeding period. Thus France and Sweden grew at the expense of Germany, and later Prussia, Austria, and Russia grew at the expense of Poland. The election of Charles I. of Spain as Emperor in 1519 led to a protracted war with Francis I. of France. In view of the overwhelming power of Charles, who, in addition to the Imperial title, united in himself the sovereignty of Spain with Naples and Sicily, the Austrian possessions of the Hapsburgs, and the enormous wealth of America and the Low Countries, the war assumed for Francis the character of a struggle for self-preservation. (See CHARLES V.; FRANCIS I.) The odds against the French King, however, were not so great as they seemed. He could depend upon the united strength of a firmly jointed nation; whereas Charles's multifarious interests and the very extent of his domains exposed him to attack from many sides. The Turks, the Protestants, the Pope at different times prevented Charles from bringing all his resources to bear against France, and that country, though defeated in four wars, suffered little loss in the end. The nature of the Reformation Charles in the beginning entirely failed to understand, and he neither made himself the leader of it nor did he consistently attempt to repress it. Protestantism, unmolested before 1530, spread rapidly over northern Germany—appealing, no doubt, most strongly to the yearning for a purer spiritual life in the mass of the people, but finding favor, too, with the princes and knightly classes, whose anarchic ambitions it tended to confirm. After 1530 all efforts on Charles's part to stamp out the progress of the Reformation were vain; and though the victory of Mühlberg (1547) seemed for a moment to make him master of the Empire and of western Europe, he was compelled during the last years of his reign to make his peace with the Protestants (Passau and Augsburg) and to see the French King actually the master of German soil (Metz, Toul, Verdun, 1552). With his abdication his huge empire fell apart. The Imperial dignity was assumed by his brother Ferdinand, and the throne of Spain with its possions in Italy and the Netherlands went to Philip II. With the overweening power of the Hapsburgs reduced and the fabric of the Holy Roman Empire crumbling under the progress of the Reformation, France's opportunity seemed to have come. But France itself fell a victim to religious strife and exhausted its energies in civil warfare (see HUGUENOTS); and it was not until the genius of Henry IV. (q.v.) had reunited all factions that France was able to revive the anti-Hapsburg policy of Francis I. and Henry II. The wide-reaching plans of Henry IV. were interrupted by his death, but they were taken up and put into execution by Richelieu (q.v.). Nor did France find its opportunity gone after the lapse of sixty years, for on the part of its rivals this had been a period of steady degeneration. The bigotry of Philip II. brought on the revolt of the Netherlands (Briel, 1572) and the loss of the northern provinces; and the strength of the Spanish monarchy was exhausted in the struggle with the Dutch and in the crusade against England. (See ARMADA.) In the Empire a succession of rulers, acting in the spirit of the Counter-Reformation (Rudolph II., Matthias, Ferdinand II.), drove the line of cleavage between Protestants and Catholics deeper than ever, and finally, by their aggressions on the reformed religion, brought on the Thirty Years' War (q.v.). This was Richelieu's opportunity. Originally a conflict for religion between members of the Empire, the war, with the incursion of Gustavus Adolphus (q.v.), developed into a war for booty on the part of Sweden and France.

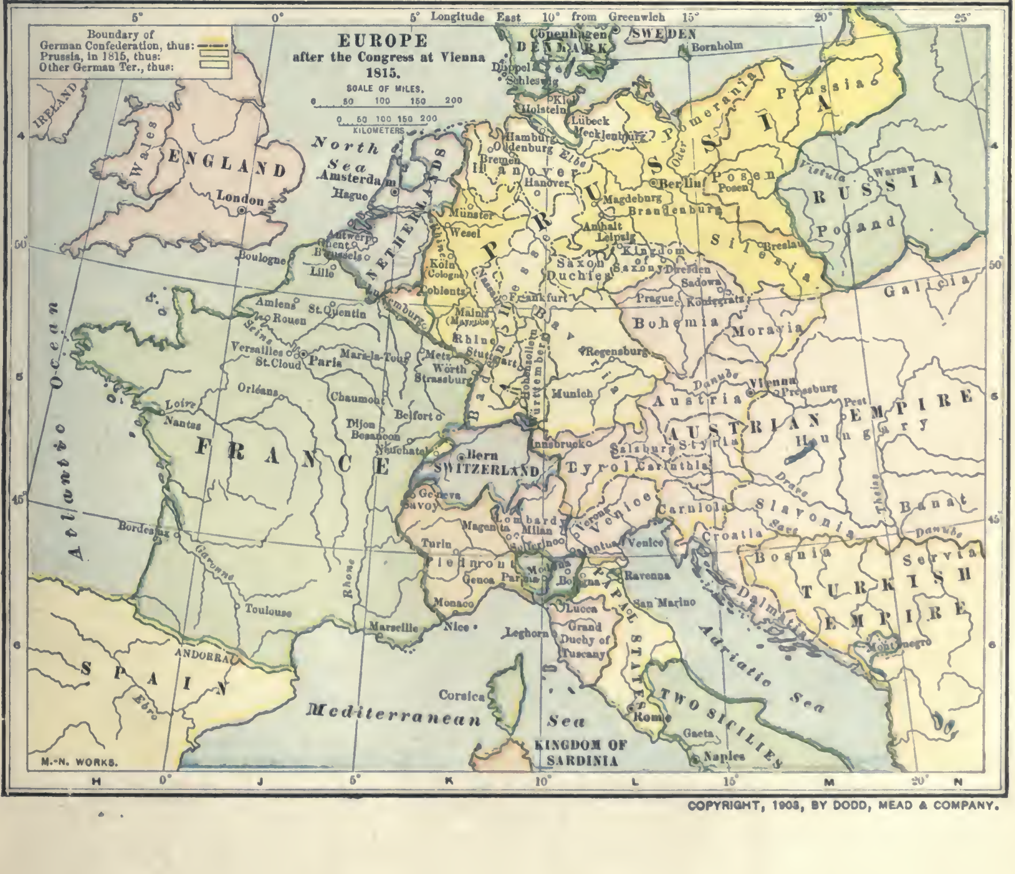
EUROPE IN 1648. The Treaty of Westphalia confirmed the dismemberment of Germany by reducing the power of the Emperor to a shadow, by making the members of the Diet virtually independent, by erecting in Germany 266 secular States and 65 ecclesiastical principalities. Sweden gained extensive territories on the southern shore of the Baltic, and France was confirmed in its possession of the three bishoprics, received territory in Alsace, and gained a foothold on the right bank of the Rhine. Westphalia left France the strongest power in Europe, and for a time France possessed in Sweden a powerful ally. Spain was forced to acknowledge the independence of the Netherlands, and, though still retaining its Italian possessions, was moribund. The Emperor recognized the independence of Switzerland, and, with the increased power of the Diet, his authority became restricted practically to his personal dominions, whose safety was threatened by the Turks. These had become and were still the masters of the greater part of Hungary, with its capital, Buda. Southern Italy, the Italian islands, Milan and Mantua, were ruled by foreign masters. Poland was weltering in anarchy and fast slipping to its doom. Russia had not yet found a great ruler to bring it on the stage of European history.

THE PERIOD OF DYNASTIC WARS (1648-1763). From Westphalia to Utrecht international relations in Europe were dominated by the aggressions of France, which, after passing through a period of civil disorder (see FRONDE), attained under Louis XIV. (q.v.) such power as to threaten for a time the other States of Europe with the same fate that France had feared from the power of Charles V. The European States were forced to unite against him; Holland, England, and Sweden in 1667; Holland, Spain, Brandenburg, and the Empire in 1672; Holland, England, Spain, Sweden, the Empire, Bavaria, and Saxony in 1689. In the course of these wars the theory of the balance of power was worked out in great detail, and the War of the Spanish Succession, in which the French armies were repeatedly worsted, demonstrated the superiority of the State system of Europe to the power of any single State, no matter how strong. The defeat of Louis XIV. carried with it the overthrow of the Swedish power in Germany. Brandenburg, strengthened by its union with Prussia (1618), and under the astute guidance of the Great Elector (1640-88), had made common cause with the enemies of Louis XIV., and by its victory over the Swedes at Fehrbellin (1675) had entered upon its destiny as the successor of Sweden on the southern shores of the Baltic. While Louis XIV. was battling against the Grand Alliance, Sweden was assailed by Denmark, Poland, and Prussia, and, in spite of its heroic King (see CHARLES XII.), lost all of its possessions on the southern shore of the Baltic with the exception of a small part of Pomerania; Prussia and Russia entering into its inheritance. The treaties of Utrecht (1713), Rastadt (1714), and Nystadt (1721) signalize momentous changes in the political balance of Europe, and things begin to assume an aspect that is familiar. The power of France is checked by the aggrandizement of Austria, which now obtains possession of the Spanish Netherlands and becomes the dominant power in Italy. France loses the control of the sea to England, which enters upon a successful career of commerce and colonization. Prussia is raised to the rank of a kingdom, and stands forward as the leading State of northern Germany. Russia under Peter the Great has gained a foothold on the Baltic. Savoy is made a kingdom, and, by the acquisition of Sardinia, becomes a prominent factor in Italian affairs. The period that follows to the French Revolution is in general one of development on these lines. France, exhausted by the wars of Louis XIV. and the excesses of his profligate successor, declines in power steadily in spite of a temporary success over Austria in the War of the Polish Succession. Prussia, under the able and unscrupulous Frederick the Great (q.v.), assumes the leadership in Germany and holds it in the great Seven Years' War (q.v.) against the united forces of Austria, France, and Russia. In this struggle Prussia receives some aid from England; but England is more actively interested in world politics than in the Continental politics, and to England fall the immense possessions of France in the New World and the ultimate control of India. Russia increases its territory at the expense of the Turks, who, since their great defeat at Vienna (1683), have rapidly been swept back, Carlowitz (1699), Passarowitz (1718), Kutschuk Kainardji (1774), marking the steady decline of their power. The greed for territory, since 1648 the moving spirit of European politics, reaches its climax in the despoliation of Poland by Russia, Prussia, and Austria, acting under the inspiration of Catharine II.

Reform and Revolution (1763-1815). In the three decades of peace which followed the Seven Years' War, the attention of European sovereigns was directed chiefly toward the internal problems of State. This was the age of benevolent despotism, when monarchs sought to reconcile the theory of absolute government with the new ideas concerning the rights of man emanating from France. Joseph II. of Austria, Catharine II. of Russia, Frederick the Great, Leopold of Tuscany, and Pombal in Portugal carried out far-reaching reforms in Church and State without conceding any increased share in the government to the people. The States of Europe were thus mere governing machines, rather than true nations, and they showed little stability when the outbreak of the French Revolution assailed the old form of things. In France (q.v.) the Revolution swept away all hereditary privileges and disabilities, destroyed monarchy, and for a time transformed the State into a confederacy of independent communes. The zeal of liberated France to extend to its neighbors the blessings of freedom, and the apprehensive hostility of the rulers of the monarchic States, brought on a series of European wars. The reaction in France against anarchy, and the stress of foreign conflict, made Napoleon (q.v.) absolute ruler of France, with governmental power more completely centralized than under the Bourbons. Napoleon's ambition converted the Revolutionary wars into Napoleonic wars, and his military and political genius made him master of half of Europe. He took the title of Emperor of the French, and regarded himself as the successor of the Frankish emperors. (See Map: Europe at the Time of Napoleon's Greatest Power.) The Emperor in Vienna, who claimed the same position, surrendered his title in 1806, henceforth calling himself Emperor of Austria only; and thus ended the Holy Roman Empire, the most venerable and the emptiest of surviving mediæval institutions. To at least one of the principles of the Revolution Napoleon remained faithful. As far as his authority or influence reached, class distinctions were swept away and all men became equal before the law. By independent legislation Prussia and other States took long steps in the same direction. (See Stein.) This was the one great direct result of the Revolutionary propaganda. For political liberty and popular government in Europe, Napoleon of his own will did nothing; nor was it his purpose to contribute in any way to the establishment of national States in central Europe. These things were not compatible with his European empire. The seeds of democracy, however, had been sown in the early years of the Revolution; and national feeling was fostered among the peoples of Europe by the struggle against foreign rule which Napoleon forced upon them. To make head against him, the monarchs were forced to make common cause with their subjects. The Constitution of 1812 in Spain, the organization of local self-government and of a popular army in Prussia, were results of French aggression; and it was the national forces of Spain that prepared Napoleon's downfall, as it was the national levies of Prussia that helped to consummate it. By establishing legal equality and by awakening the desire for national self-government the Revolution gave a unity to subsequent developments in Europe, which had not been seen since the Reformation broke up the uniformity of the mediæval civilization. Yet Europe, after the fall of Napoleon, entered on a period of sharp recoil from the ideals of the Revolution. At the Congress of Vienna (1814-15) the Powers, under the leadership of Austria, made a deliberate attempt to return to the conditions that had prevailed before 1789. The map of Europe, with which Napoleon had played havoc, was reconstructed in the interest of 'legitimacy,' and of the balance of power, that great ideal of eighteenth-century statecraft. France was restricted to her ancient boundaries. Belgium and Holland were united into a kingdom to keep watch on the northern boundary of France. Norway was taken from Denmark and given to Sweden, to make up for the annexation of Finland by Russia. Russia received also the Grand Duchy of Warsaw, which was organized as a separate Kingdom of Poland. For the unity of Germany and of Italy nothing was done. Prussia and Austria were both strengthened. Prussia gained territory chiefly in northern and western Germany, Austria in Italy. The smaller German States and free cities, greatly reduced in number, were united with Prussia and Austria in a German confederacy, in which Austria held the presidency. In



EUROPE
at the Time of
the Greatest Expansion of
NAPOLEON'S POWER, 1812.



EUROPE
after the Congress at Vienna
1815.

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Italy, Sardinia was strengthened; but Austria held a dominant position in the north. The Papal States were reëstablished, and Naples and Sicily were restored to their Bourbon ruler. (See Map: EUROPE AFTER THE CONGRESS OF VIENNA.)

REACTION AND REVOLUTION (1815-52). The purpose of the Congress of Vienna was to reëstablish legitimate monarchic authority. To maintain this authority and to resist all revolutionary movements, an alliance was formed by the Emperors of Russia and Austria and the King of Prussia. (See HOLY ALLIANCE.) Of this alliance and of the reactionary policy followed by the majority of the European governments till 1848 Metternich (q.v.), the Austrian Minister, was the directing spirit. Among the peoples of Europe, however, there was a natural desire for some share in government; and in Germany and Italy there was a strong desire for national unity. The attitude of the princes made it appear impossible that unity could be attained except through popular sovereignty. For this reason the nationalists in Germany and Italy became revolutionists and, to a large extent, republicans. Revolutionary agitation was maintained by secret associations. (See BURSCHENSCHAFT; MAZZINI; YOUNG ITALY.) The first popular outbreaks occurred in 1820 in Spain and in Naples. In each of these kingdoms the monarch was forced to grant a liberal constitution. Acting under the authorization of European congresses, Austria forcibly intervened in Naples and France in Spain; the objectionable constitutions were withdrawn, and absolute royal government was reëstablished. The next purely political outbreak occurred in 1830 in France. Louis XVIII. had granted his people a constitution, and had reigned in peace. Charles X. attempted to subvert the constitution, and was deposed. (See JULY REVOLUTION.) Louis Philippe, of the House of Orleans, was made King, and a more liberal constitution was adopted. The French example stirred the Liberals to action in other parts of Europe. In Germany a few of the smaller kingdoms and principalities had already received representative constitutions; in 1830, in consequence of popular demonstrations, nearly all the other minor States were constitutionalized. The governments of Prussia and of Austria, however, made no such concessions. In Belgium and in Poland insurrections occurred, which were national rather than political. The Belgians revolted against the Dutch rule and elected Leopold of Saxe-Coburg as their King; and France and England forced Holland to recognize Belgian independence (1831). Poland rebelled against its King, the Russian Czar; but this rebellion was crushed and Poland became a Russian province. In 1848 France was again in revolution. (See FEBRUARY REVOLUTION.) Louis Philippe had resisted the demand for a wider suffrage and was deposed. A republic was established; a struggle followed between the socialistic and conservative elements; a socialistic rising in Paris was put down with much slaughter; Louis Napoleon was elected President. Three years later the President overthrew the Constitution, and in 1852 he assumed the title of Emperor. (See NAPOLEON III.) Both of these changes were approved by vote of the French people. In 1848, as in 1830, the disturbances at Paris were followed by disturbances throughout central Europe. Popular uprisings at Berlin and Vienna forced the Prussian and Austrian rulers to grant constitutions. Here and everywhere else in Germany the revolutionary leaders also demanded national unity. All the German kings and princes bowed to the storm, and a parliament was assembled at Frankfort to draw up a constitution for a united Germany. Simultaneously the people of Schleswig-Holstein took arms against Denmark and demanded that these duchies should be incorporated in the new Germany; while the Bohemian, Hungarian, and Italian subjects of Austria rose against German rule. The Austrians were driven out of Lombardy and Venice, and throughout the rest of Italy the people either expelled their princes or forced them to send troops to the aid of the insurgent Venetians and Lombards. The united Italian forces were placed under the command of the King of Sardinia. All these movements came to nothing. The Austrian Army restored order in Bohemia and at Vienna, and defeated the Italians. With the aid of Russia, the Hungarian insurrection also was crushed. All the Italian princes recovered their thrones; the Pope, who had been expelled from Rome, was reinstated by Napoleon. The Frankfort Parliament, after long deliberation, determined to organize all Germany except Austria as a federal empire, and offered the King of Prussia the Imperial crown. He declined the offer and the German Parliament dispersed. A belated attempt of the King of Prussia to organize the 'narrower Germany' on more conservative lines than those proposed at Frankfort also failed. The old confederation was reëstablished, and the people of Schleswig-Holstein were again made subject to the King of Denmark.

EASTERN AFFAIRS (1815-56). In 1821 a rising against the Turks in Wallachia gave the signal for insurrection in Greece. After several years of conflict, Russia, England, and France intervened. The allies destroyed the Turkish-Egyptian fleet at Navarino (1827), and Russia declared war on Turkey (1828). The peace of Adrianople (1829) guaranteed to Servia, Wallachia, and Moldavia the management of their own affairs under Christian governors, and made Greece independent. Greece was organized as a kingdom under Otto of Bavaria (1832-62). In 1831 war broke out between the Viceroy of Egypt, Mehemet Ali, and his suzerain, the Sultan, and the Turkish forces were worsted. Russia intervened and brought about peace, taking pay for its services in a treaty of alliance (Unkiar-Skelessi, 1833) which practically gave it a protectorate over the Turkish Empire. In 1853, after attempting to arrange with England a partition of the Turkish Empire, Russia occupied the Danubian Principalities. Austria and Prussia assumed an attitude of unfriendly neutrality; England and France came to the aid of Turkey, and carried the war into Russian territory. (See CRIMEAN WAR.) The Peace of Paris, 1856, pushed Russia back from the mouth of the Danube (Bessarabia, previously Russian, being ceded to Moldavia), neutralized the Black Sea, and placed Turkey under the protection of Europe. In return Turkey promised reforms.

NATIONAL ORGANIZATION OF ITALY AND GERMANY (1859-71). The unification of Italy and Germany, which the popular revolutions of 1848 had failed to achieve, was accomplished by revolution from above. In Italy the movement was initiated and directed by the Sardinian Premier, Cavour (q.v.); in Germany it was carried through by the Prussian Premier, Bismarck (q.v.). Austria was the great obstacle to both movements, and it took two great wars to expel the Austrians from Italy and from Germany. It was not in the interest either of Russia or of France that strong States should be established in central Europe; but Russia remained neutral, because, remembering the aid given to Austria in 1849, the Czar bitterly resented the 'ungrateful' attitude assumed by Austria during the Crimean War; and Napoleon III. (q.v.) assisted Sardinia and encouraged Prussia, partly in expectation of petty advantages, partly by reason of an unpractical zeal for the 'principle of nationality.' In 1859 France and Sardinia defeated Austria, and Sardinia obtained Lombardy. France was paid for her services by the cession of Savoy and Nice. Simultaneously all the small States of North Italy and the northern provinces of the States of the Church established revolutionary governments and demanded union with Sardinia. In 1860 Garibaldi (q.v.) overthrew the Kingdom of the Two Sicilies and placed all Italy south of Rome in the hands of the King of Sardinia. In 1861 the Kingdom of Italy was established, including all of the peninsula except Venice and Rome. During these movements Prussia stood inactive. In 1863 Denmark, in violation of its treaty engagements, endeavored to incorporate Schleswig. Prussia, of which Bismarck was now Premier, acting in concert with Austria, made war on Denmark, and the allies obtained joint sovereignty over Schleswig-Holstein (q.v.). In 1866, in alliance with Italy, Prussia made war on Austria. Austria was supported by all the South German States and by the more important States of North Germany, but victory rested with Prussia. (See SEVEN WEEKS' WAR.) Italy obtained Venice; Prussia annexed a considerable part of North Germany, and organized with the remaining principalities and cities a North German federal State, of which the King of Prussia was hereditary President. Failing to obtain any compensation for his benevolent neutrality, Napoleon III. was forced by French popular feeling to quarrel with Prussia and to endeavor to arrest the unification of Germany. In the ensuing war (1870-71) the South German States acted with Prussia; and during the German siege of Paris, King William of Prussia was proclaimed Emperor of a united Germany. To this new empire France was forced to cede Alsace and a part of Lorraine. (See FRANCO-GERMAN WAR.) During the war, Italy annexed Rome.

THE ROMAN CATHOLIC CHURCH AND THE MODERN STATES. Just before the occupation of Rome by the Italians, an Ecumenical Council (1869-70) had accepted the dogma of Papal infallibility. Viewed politically, this dogma signifies the complete subjection of the bishops to Papal authority and the centralized guidance of the Church militant in its struggle against what it regards as the usurpations of the modern States. Simultaneously Catholic or 'Ultramontane' parties were organized (or reorganized) in many of the European States; and while these parties deny the right of the Church to direct their political activity, they are supported by Church influence and work in accordance with the general policy of the Church. In Prussia and other States these movements have led to legislation intended to check the political activity of the clergy and to diminish the control of the Church over education. (See KULTURKAMPF.) The furthest step was taken by the French Republic in 1902 in the effort to resist and supervise education by the clergy .

EASTERN AFFAIRS (1856-98). The integrity of the Turkish Empire, guaranteed by all the Powers in 1856, has since been seriously impaired. In 1859 Moldavia and Wallachia elected the same 'hospodar' or governor; in 1866 they were united under Prince Charles of Hohenzollern into a practically independent State. In 1871, taking advantage of the disturbed state of Europe, Russia, with the support of Germany, obtained from the Powers the abrogation of those provisions of the Treaty of Paris which limited its naval forces in the Black Sea. In 1875 insurrections broke out in Bosnia and Herzegovina, and shortly afterwards in Bulgaria. The latter revolt was crushed with such cruelty that European sentiment was outraged, and the Powers, after fruitless negotiations, left Russia free to deal with Turkey. The fourth Russo-Turkish war of the century, 1877-78, ended with the Russians at the gates of Constantinople. (See RUSSO-TURKISH WAR.) A preliminary peace (see SAN STEFANO) went so far in the dismemberment of Turkey that the Powers insisted on its revision. (See BERLIN, CONGRESS OF.) The settlement effected at Berlin has since been modified. Of the three principalities recognized as independent—Rumania, Servia, and Montenegro—the first two have become kingdoms. Bosnia and Herzegovina, of which the administration was intrusted to Austria, have become in fact Austrian provinces, although the fiction of Turkish suzerainty is retained. Bulgaria and East Rumelia were united, by the revolution of 1885, into a single tributary principality. In order to preserve 'the balance of power' in the Balkan Peninsula, Servia attacked Bulgaria, but was badly beaten. In one direction only have the limits of Turkey been widened. In 1897 Greece interposed to protect its fellow-countrymen in Crete, and in the ensuing war with Turkey the Greek armies were so decisively defeated that the Powers felt constrained to grant to the victor a 'rectification' of his Thessalian frontier. They took from the Sultan, however, the administration of Crete, and in 1898 they selected Prince George of Greece as their 'high commissioner'; so that Crete is now practically an independent principality, under Greek rule. About 15,000 Turks emigrated from Crete to Constantinople or to Asia Minor. In Asia and in Africa Turkey and Islam have suffered other losses in the course of the nineteenth century; the most noteworthy events being the gradual advance of Russia into central Asia and into the northeastern corner of Asia Minor, and the establishment of French supremacy in Algiers and Tunis, and of English supremacy in Egypt.

EUROPEAN POLITICS AND WORLD POLITICS. After 1871 Austria sacrificed its resentment to its interests, and entered into friendly relations with Germany and Russia. Until 1878 the dominant feature of European politics was the coöperation of these three empires. Republican France was isolated. In 1878 Russian dissatisfaction with the results of the Congress of Berlin, and with the part played by Germany, led to strained relations between these two Powers, and Germany entered into a formal alliance with Austria. Early in the eighties Italy was admitted as a third partner.

The Triple Alliance thus established has several times been renewed, and still exists. In the nineties Russia and France drew together, and in 1897 it was announced that an alliance existed between these Powers. From these Continental alliances Great Britain has held aloof; but arrangements for common action in the Mediterranean have long existed between Great Britain and Italy. Both the Triple Alliance and the Franco-Russian alliance grew out of, and are concerned chiefly with, European politics. In world politics, Germany, which embarked in 1884 upon colonial enterprises, has from time to time acted in harmony with France and with Russia. The partition of Africa (q.v.) between European States, the seizure of portions of China (see Chinese Empire), and the division of the rest of that empire into 'spheres of influence,' are the most recent steps in that extension of European power over other continents which began with Alexander the Great, was continued by the Romans, was suspended for eleven centuries by counter-attacks from Asia, and began again in the sixteenth century. Since the unification of Italy and of Germany, Europe has attained something like a stable equilibrium; the Turkish question is partly solved and partly postponed; the Austrian question has not yet arisen. The aggressive energy of the great European nations must find its field outside of Europe; and world questions have begun to dominate European politics. Since the Congo Conference at Berlin (1884-85), there has been an increasing tendency to joint European action in this wider field.

Europe in 1900. The population of Europe at the close of the nineteenth century was about 390,000,000, and during the later decades of the century the average annual increase, in spite of emigration, was about 3,000,000. The peoples of modern Europe are for the most part of mixed origin; but taking language as the test, and grouping cognate languages, nearly 29 per cent. of the inhabitants of Europe are Slavs, more than 30 per cent. are Latins, and more than 32 per cent. are Teutons—the third group including the English, the Scandinavians, the Germans, the Dutch, and the Flemings. Outside of these three groups are the Finns, the Hungarians, and the Turks (all these are Mongols), the Greeks, the Jews, and scattered representatives of other races—all these together constituting less than 9 per cent. of the total population. Roughly speaking, Europe is Slavic in the east, Teutonic in the northwest and north centre, Latin in the southwest and south. More than 96 per cent. of the inhabitants of Europe are Christians, nearly 25 per cent. belonging to the Eastern churches, about 24 per cent. to the various Protestant churches, and more than 47 per cent. to the Roman Church. This triple division of the Christian population of Europe corresponds, in the main, to the triple division of language groups; the Latins are nearly all Roman Catholics, the Slavs are mainly Greek Christians, and three-fourths of the Teutons are Protestants. Politically, Europe consists of 23 independent States, varying in population from 115,000,000 (European Russia) to 5200 (Andorra). There are four empires, viz., Germany, Austria-Hungary, Russia, and Turkey; 11 kingdoms, viz., Great Britain, the Netherlands, Belgium, Sweden-Norway, Denmark, Spain, Portugal, Italy, Greece, Rumania, and Servia; 4 independent principalities, viz., Monaco, Lichtenstein, Montenegro, and the Grand Duchy of Luxemburg; and four republics, viz., France, Switzerland, Andorra, and San Marino. Four of these States are organized on federal lines, viz., Germany, which includes 4 kingdoms (Prussia, Bavaria, Württemberg, and Saxony); 18 grand duchies, duchies, and principalities, and 3 city republics; Switzerland, which consists of 25 canton republics; and Austria-Hungary and Sweden-Norway, each of which is divided into two largely autonomous portions. In the Turkish Empire there are States or provinces which are under Turkish suzerainty, but not under Turkish government; but their connection with the Empire is nominal. All the other States of Europe are single or unitary States. Most of the European States either have a substantially homogeneous population or contain only a small proportion of heterogeneous elements, as in the case of Great Britain, Germany, and European Russia. In Austria-Hungary, European Turkey, and Switzerland, however, the population is so heterogeneous that no one nationality is preponderant; and in Belgium the French and Flemish elements are of nearly equal strength. In four European States monarchic absolutism still prevails. These are Russia, Turkey, Monaco, and Montenegro; but in Montenegro the rule of the Prince should perhaps be termed patriarchal rather than absolute. In all the other monarchic States the government is limited by constitutions granting more or less power to the representatives of the people. In the group of constitutional monarchies, princely authority is least limited in Germany, Austria-Hungary, and Denmark. In the other constitutional monarchies, and in the French Republic, parliamentary government obtains; but on the Continent the working of this system is greatly embarrassed by the multiplicity of parties (see Political Parties), and in some States which nominally have parliamentary government the system actually in operation is quite unlike the English model. In few of the larger States of Europe is administration so centralized as was the case at the beginning of the century: local self-government has been established not only in most of the Teutonic States, but also in France and in Italy. The Great Powers by whose concerted action, when the concert can be established, the political development of Europe is controlled, are Great Britain, Germany, Russia, France, Austria-Hungary, and Italy. In estimating the relative strength of these States, the chief elements to be considered are: Size and character of population, economic resources, and efficiency of organization. Taking all these things into consideration, Germany and Great Britain seem to be at present the leading Powers. With the fuller development of its resources and with a more efficient organization, Russia should become stronger than either; but at present Russia is probably less strong than France, although stronger than Austria-Hungary. Italy is the least of the Powers, and owes her recognition as a Power mainly to her alliances.

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EUROPE, PEOPLES OF. All Europeans belong to the White or Caucasian and the Yellow or Mongoloid varieties of man. Throughout historic time Europe has been a meeting-ground of races, differing from each other in complexion, stature, physical features, temperament, language, occupation, social organization, government, opinion, and religion. In studying the ethnology of this portion of the Eastern Hemisphere it is imperative to hold these several categories apart in the

THE WHITE RACES OF EUROPE

HELLENIC FAMILY – A GREEK

SLAVIC FAMILY – A RUSSIAN

TEUTONIC FAMILY – A GERMAN

HEBREW FAMILY

KELTIC FAMILY – AN IRISHMAN

LATIN FAMILY – AN ITALIAN

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mind, especially those of race or blood kinship, the result of cross-breeding; speech or linguistic affinities, the result of acculturation; arts, the result of commerce or contact; and social life or nationality, the result of conquest. It is true that these concepts are related, and each is of value in the whole account of any people. When, however, one attempts to argue that people who speak the same language or practice the same arts are necessarily akin, confusion is certain to arise.

Beginning with the first account of ancient man in Europe, paleo-ethnology may be divided into three parts: (1) Tertiary man, or the origin of humanity; (2) Quaternary man, or the development of humanity; (3) present types of man. It is to be distinctly understood that this classification is intended only as a guide to study. New discoveries are constantly demanding new adjustments with reference to the earliest races of men in Europe.

The existence of Tertiary man is yet in doubt, for our sole information concerning him rests upon the finding of extremely rude stone implements in geological layers which are thought to be Tertiary. These supposed primitive implements may be, however, only the refuse of later manufactures of more delicate objects. Such is the case in America, where, at first, materials of this character were regarded as showing the existence of man on this continent many thousands of years ago. They are now known to be the quarry refuse of historic tribes.

Still keeping in mind geological epochs, European archæologists divide human culture into Prehistoric, Protohistoric, and Historic. Again, it is thought possible to separate the life of man in Europe into ages according to the materials which characterize the several periods, as the Stone Age, Bronze Age, and Iron Age. It must be remembered at this point, however, that the word 'age' does not refer to definite chronological dates, but that in the progress of human development man lived first in the stone grade, next in the bronze grade, and lastly in the iron grade of culture.

Leaving out of view, then, the question as to the existence of man in the Tertiary period, substantial exploration begins with the Quaternary epoch. In his investigations there the inquirer is everywhere confronted by problems concerning cosmic changes in climate, the plants and animals which were contemporaneous with man during these changes, the species or varieties of man based on the human crania actually discovered, as well as on the progress in arts, especially those in stone. Notwithstanding the speculative character of much that is affirmed about Quaternary man in Europe, an examination of the accumulated evidences leaves the impression of a long perspective of history, in which the life of the species, at first almost as naturistic as that of the beasts, was gradually transformed by human ingenuity into the higher culture, the life wherein nearly every conscious action is performed artificially. On the assumption that the forward movement of this artificial life is an unquestionable fact, the relics of human industry discovered in the caves and other archæological stations throughout all the countries of Europe may be mapped out in a series. Attempts have been made to mark epochs in this progress, and names have been given to them from locations where typical specimens of that particular grade of art were to be found, beginning with the Chellean, and ending with the Tourassian for the Paleolithic period.

EUROPEAN PALEO-ETHNOLOGY

Times		Ages	Periods	Epochs
Actual or Recent Quaternary	Historic	Of iron	Merovingian	Wabenian (Waben, Pas-de-Calais).
			Roman	Champdolian (Champdolent, Seine-et-Oise).
				Lugdunian (Lyon, Rhône).
	Protohistoric		Galatian	Beuvraysian (Mont Beuvray, Nièvre).
				Marnian (Department of the Marne).
				Hallstattian (Hallstatt, Austria).
		Of bronze	Tsiganian	Larnaudian (Larnaud, Jura).
				Morgian (Morges, Vaud, Switz.).
	Prehistoric	Of stone	Neolithic	Robenhausian (Robenhausen, Zürich).
				Tardenoisian (Fère-en-Tardenois, Aisne).
Ancient Quaternary			Paleolithic	Tourassian. Hiatus (La Tourasse, Haute-Garonne).
				Magdalenian (La Madeleine, Dordogne).
				Solutrean (Solutre, Saone-et-Loire).
				Mousterian (Le Moustier, Dordogne).
				Acheulean (Saint Acheul, Somme).
				Chellean (Chelles, Seine-et-Marne).
Tertiary			Eolithic	Puycournian (Puy-courny, Cantal).
				Thenaysian (Thenay, Loir-et-Cher).

As for man himself, out of less than fifty skulls to which the title Quaternary has been applied, not more than a dozen can be vouched for as beyond question. All of them are longheaded or dolichocephalic in form. That is, the ratio of the length to the width of the skull is less than 80-82. With our present knowledge it is possible to divide the oldest crania into the following types: the Neanderthal or spy man, referable to the Mousterian Epoch (q.v.); and the Laugerie Basse and Chancelade (Dordogne) type, to be referred to the Magdalenian Epoch. (See MADELEINE.) The Neanderthal-spy type had the cephalic or length-width index of the skull, 70-75.3, together with a low, retreating forehead, prominent brow-ridges, and probably low stature, about 1.59 m., or 62½ inches. This race did not fully disappear from Europe in early times. Neanderthaloid skulls have been

Climatic and Other Changes in the Paleolithic Epochs

No.	Climate	Geologic action	Plants	Animals
1 Tourassian	As at present			Fauna of to-day, Cervus elaphus abundant. Reindeer disappears.
2 Magdalenian	Cold and dry	Formation of red earth with angular pebbles	Polar moss in Württemberg	Man, race of Laugerie Basse. Great development of northern fauna, reindeer, etc. Extinction of mammoth.
3 Solutrean	Mild and dry	Retreat of the glaciers		Horse abundant. Reindeer. Mammoth. Increase of rhinoceros.
4 Mousterian	Cold and moist	Great extension of glaciers, and consequent changes of the soil and levels	Flora of cold regions	Arctic fauna. Mammoth, Rhinoceros tichorinus, Cave-bear. Musk-ox.
5 Acheulean	Mild and moist	Alluvium of the high levels. Loam of the plateaus	Flora in transition	Fauna intermediate. Appearance of mammoth. Disappearance of Elephas antiquus.
6 Chellean	Warm and humid	Subsidence. Filling of the valleys. Alluvium everywhere at lower levels	Flora sub-tropical. Mediterranean plants in Seine Valley	Man. Neanderthal race. Tropical fauna. Hippopotamus. Rhinoceros Merckii, Elephas antiquus. Extinction of Tertiary forms.

Classification of Quaternary Culture in Europe

Period	Epoch	Technic	Characteristic implements
End of the Paleolithic	Tourassian	Workmanship in bone and stone degenerated	Harpoon heads flat, with large barbs, in antler. Passage from the Paleolithic period into the Neolithic.
Upper Paleolithic	Magdalenian	Development of work on bone and hard substances	Burins or gravers in flint. Flint blades thin and symmetrical. Development of bone implements and of fine art.
	Solutrean	Flints worked by pressure	Laurel-leaf blades. The skin-scraper appears. Apogee of stone implements.
Middle Paleolithic	Mousterian	Flints that show retouching (chipped and flaked)	Stone blades to be held in the hand, knives and choppers. Blades wide and thick, and chipped on one face only. Disappearance of the flaked axe (*coup de poing*).
Transition Paleolithic	Acheulean	Mixed art	Leaf-shape blades, *langue de chat*, narrower, thinner, more delicate, and carefully finished.
Lower Paleolithic	Chellean	Made by direct blows	Only one stone implement, the *coup de poing*, large, coarse, with large facets on each side.

found in the later prehistoric and historic graves and dolmens, and individuals of the same type exist in Europe and America at the present time. The Laugerie-Chancelade type was also long-headed like the other, but the forehead was higher and the skull more capacious. The projecting brow-ridges were absent, the orbits were higher, the face with its prominent cheek-bones was elevated and broad, but the stature was low. After these two types, short of stature, came the so-called Cro-Magnon race, who were extremely long-headed, the ratio of the head length to the width being from 63 to 75; the face and the orbits were low, but the stature was lofty, approaching 68 inches.

After these vague epochs came the Neolithic or Polished Stone Period, followed by the Bronze or Tsiganian Period, and this by the Age of Iron. These changes did not come by sudden breaking down of the stone and bronze ages, but by transitional steps with a separate history in each of the countries of Europe. For instance, the Polished Stone Period was not developed simultaneously over the Continent. Scandinavia, in its northern parts, was covered with glaciers, and only in the refuse-piles in Denmark are polished stone hatchets found contemporaneously with Neolithic tools of the rest of Europe. There were even, until quite recently, tribes in Russia who were still in this grade of progress.

These ancient Neolithic peoples were sedentary and industrial. Their food was not obtained wholly by natural processes, but artificialism in the cultivation of the soil and the domestication of animals progressed. Their homes were no longer movable tents, but substantial buildings. They constructed the pile dwellings of Switzerland, France, Italy, and perhaps of Ireland. They buried their dead under dolmens, and it was they who set up huge megalithic monuments in England, Brittany, and Spain.

The Neolithic peoples of the British Isles, as well as of other parts of western Europe, were quite long-headed, the ratio of the length to the width of the skull being as low as 65-75. These earliest of European industrial peoples had also long faces like some existing populations of Europe. It must be carefully noted at this point that in Sweden, France, Switzerland, Germany, Austria, Spain, and Portugal crania of short-headed peoples are found mixed with dolichocephalic skulls. This tells an important story, for it clearly shows that with progress race-mixture had begun to take place, the borrowing of blood being associated with the community of arts. Another fact worthy of notice is that the erection of huge stone and earth monuments, called barrows by ethnologists, indicates the consolidation of society, implying an increasing number of persons who could be brought together in the same enterprise, and the consequent raising of an artificial food-supply so that these masses might coöperate for longer periods of time.

The so-called Ages of Metal in Europe, that is, of Copper, Bronze, and Iron, comprise the remaining epochs in the popular scheme of European archæology. In America the earliest implements in copper were cold-hammered and ground into shape, the material being treated technically precisely as if it were stone. It is not surprising, therefore, to find the same condition of things in Europe. The parallelism is almost perfect in every respect. Copper tools and weapons do not mark a separate epoch, meaning that the stone implements ceased to be used at once, nor must it be inferred that there was a Copper Age as distinguished from a Bronze Age, for copper tools and weapons are found associated with bronze relics. And here arises one of the most interesting inquiries of all, how far the exquisite products in bronze, found all over Europe, are results of indigenous development, and how far they indicate commerce or instruction from without. There is no doubt that both of these factors coöperated, the result of which was the art as it existed in each region.

It is a well-known law of progress that suggestion is one of the strongest incentives to the use of materials and processes. There existed in central and western Europe a Bronze Age, which in some characteristics of its products resembles the Orient and in others is entirely original. The art of bronze smelting and working could not arise originally and develop completely and independently in any land; and secondly, such an art could not be imposed bodily upon a people who were not far enough advanced to add to it many thoughts and technical processes of their own. Progress and complexity in artificial activities are produced by the mutual influence of races and peoples. In proof of this, the Bronze Age witnessed the coming of a great variety of physical types. In England the people became more brachycephalic, the ratio of head-length to head-width being 81. In Sweden and Denmark long-headed people, tall and fair-haired, coëxisted with those of much larger index. In the Valley of the Rhine, as well as in southern Germany and Switzerland, the dolichocephaly was more pronounced. Knowledge of the use of fire among the peoples of the Bronze Age was contemporaneous also with the cremation of the dead.

The earliest relics of the Iron Age are found in the hamlet of Hallstatt (q.v.), in Upper Austria, in thousands of graves, revealing implements of industry, weapons, and personal ornaments, but no pottery. At first it seemed to have had no affiliation with any other national art, but later researches put the earliest Iron Age as a medium between the more advanced art of southern Europe and the West. Iron gradually replaced bronze, which had then passed into its æsthetic stage, and revealed the existence of Oriental influence in Europe. The long heads also became mingled with short heads, and in the La Tene, also called Marnean, epoch, skulls vary almost as much as at the present day.

The types of races mentioned extend far beyond the boundaries of Europe into Asia and Africa. The lines between the continents are entirely artificial.

Ripley finds three separate biological races of men in Europe:

1. TEUTONIC RACE. Dolicho-leptorhine of Kohlmann; Reihengräber of German writers; Germanic of English; Kymric of French; Nordic of Deniker; and Homo Europæus of Lapouge.
2. ALPINE RACE (or Celtic). Celto-Slavic of French writers; Sarmatian of Von Hölder; Disentis of German writers; Arvernian of Beddoe; Occidental of Deniker; Homo Alpinus of Lapouge; and Lappanoid of Pruner-Bey.
3. MEDITERRANEAN RACE. Iberian of English writers; Ligurian of Italian writers; Ibero-Insular and Atlanto-Mediterranean of Deniker.

RACE	HEAD	FACE	HAIR	EYES	STATURE	NOSE
1 Teutonic	Long	Long	Very light	Blue	Tall	Narrow, aquiline
2 Alpine (Celtic)	Round	Broad	Light chestnut	Hazel-gray	Medium, stocky	Variable broad, heavy
3 Mediterranean	Long	Long	Dark brown or black	Dark	Medium, slender	Rather broad

Inquiry into the causes of difference in stature, head-form, and color, leads to the profoundest of biological studies. To say that inheritance and variation is sufficient to account for them is to explain nothing. Even stature is not always a matter of nutrition. Much controversy has arisen over the origin of blondness in northern Europe. No doubt, albinism is more pronounced in Europe. Its marked appearance elsewhere is among the kindred peoples in northern Africa and southeastern Asia. The popular notion that exposure to the action of the sun's rays is the cause of brunetteness is altogether at fault. No single known cause produces either albinism or brunetteness. It is quite probable that long ago the subspecies to which Europeans belong were yellow or Mongoloid in color, and that by the coöperation of environment and obscure physiological processes these characteristics became fixed and persistent through heredity.

Having fixed these three biological types in mind, the difficulty is in finding their representatives in modern Europe. Race is a matter of blood kinship, requiring isolation under favorable conditions for bringing about new characteristics that become distinguishing and hereditary. These combined marks define race, and are not to be confounded with the term 'people.'

A people is a collection of human beings living together under a definite nationality and occupying a specific region. It is an expansible term, applying, it may be, to a small community, as the people of a certain valley or plain, but can also include all who are under the sway of a great nationality. In Europe there are the people of

France, Belgium, Scandinavia, and Germany; of Italy, Spain, and Portugal; of Switzerland, Tyrol, and the Netherlands; of the British Isles, Russia, Turkey, and Greece; and each one of these peoples becomes a problem to be solved with reference to race. No people are of one race, no race is confined to a single people. The entire population of Europe is 360,000,000, and besides the three races already mentioned, which include nearly all of this number, there are a few straggling peoples belonging to other races, such as the Basques, Lapps, Magyars, Semites, and Gypsies.

In the classification just described the races are only ideal types; but one of the latest authors on this subject, Deniker, publishes a scheme of the races of men more after the manner of the naturalists. Passing by the assumption that there may have been formerly a certain small number of typical races out of which all the peoples of Europe have grown, he takes the total population as he would a number of animals, and divides them up on biological characteristics as he finds them, without inquiring into their causes. The nations and peoples now existing in Europe have arisen from mixture in varying proportions of ancient varieties of our species. By abstracting from these millions of individuals certain ones having groups of definite characteristics relating to stature, the form of the head, pigmentation, and other somatic data, Deniker determines the status of each race, giving rise to six principal and four secondary races, leaving out Lapps, Ugrians, Mongolians, and others belonging to Asia.

DENIKER'S SCHEME OF EUROPEAN PEOPLES

I. WAVY BROWN OR BLACK HAIR, DARK EYES.	
1. *Littoral European race*—tall stature; elongated, oval face; straight fine nose; mesocephalic.	Tawny white skin, black hair.
2. *Ibero-Insular race*—short stature, dolichocephalic.	
3. *Western European race*—short stature, round face, strongly brachycephalic.	Dull white skin, brown hair.
4. *Adriatic race*—tall stature, elongated face, brachycephalic.	
II. FAIR, WAVY, OR STRAIGHT HAIR, LIGHT EYES.	
5. *Northern European race*—somewhat wavy hair and reddish; tall stature; dolichocephalic.	Reddish white skin.
6. *Eastern European race*—somewhat straight flaxen hair; short stature; sub-brachycephalic.	

Sergi pushes the study of classifying Europeans still further into the domain of natural history. In his work on the Mediterranean Race, he emphasizes the obligations which modern Europe owes to ancient peoples, like the Hamites of Egypt and northern Africa, the Semites of southwestern Asia, the early Greeks, Italians, and Iberians, for the foundation of their culture.

Laying aside the biological divisions of European peoples or countries, the concept of speech may be invoked to show what languages they use. At the outset it is affirmed that no people belong to one language, no language is confined to one people. The following general scheme shows the relationship between nationality and languages in Europe:

INDO-GERMANIC.

1. *Celtic group.*
   a. Gaelic. Irish, Highland Scotch, and Manx.
   b. Cymric. Welsh, Low Breton, and Cornish (extinct).

2. *Romance group.*
   a. French, in 18 dialects. The Langue d'Oc and Langue d'Oil are its two Romanic forms.
   b. Italian, 14 principal dialects.
   c. Spanish.
   d. Provençal, 8 dialects.
   e. Rumanic.
   f. Portuguese.
   g. Rumansch or Churwaelsh.

3. *Germanic group. Scandinavian branch.*
   a. Swedish.
   b. Danish or Danske.
   c. Icelandic.

4. *Germanic group. Germanic branch.*
   a. High German.
   b. English.
   c. Platt-Deutsch.
   d. Dutch, with Flemish dialect.
   e. Frisian.

5. *Slavic group. Eastern branch.*
   a. Russian, with Ruthenian or Little Russian dialect.
   b. Bulgarian.
   c. Servian, with Sloventzi or Wend dialect and Croat dialect.

6. *Slavic group. Western branch.*
   a. Polish.
   b. Czech or Bohemian.
   c. Wend, of Brandenburg and Silesia.

7. *Lettic group.*
   a. Letts.
   b. Lithuanian, with Shamaite and Prussian Lithuanian dialects.

8. *Hellenic group.*
   a. Greek.

9. *Illyrian group.*
   a. Albanian.

10. *Indic group.*
   a. Gypsy or Romany, in several dialects.

The dead languages of the family in Europe are: Etruscan (doubtful), Oscan, Umbrian, Latin, and Langue d'Oc and Langue d'Oil, of the Romance group; Gothic, Anglo-Saxon, Old Saxon, Old Dutch, Old Frisian and Old Norse, in the Germanic group; Church Slavic, Old Bohemian and Polabish, in the Slavic group; Old Prussian in the Lettic Group; ancient Greek with its dialects.

TURANIAN OR FINNO-TATAR FAMILY.

1. *Finnic group. Tchudic branch.*
   a. Finnic or Suomic, two dialects.
   b. Esthonian.
   c. Tchoud.
   d. Lapp.
   e. Voth.
   f. Livonian.

2. *Finnic group. Permian branch*
   a. Votiak.
   b. Sirian or Siryanian.
   c. Permiak, with Bissermian.

3. *Finnic group. Volgaic branch.*
   a. Tchuvash.
   b. Mordvin.
   c. Cheremiss.

4. *Finnic group. Ugric branch.*
   a. Magyar or Hungarian, with Szekler dialect.
   b. Samoyed.

5. *Tataric group.*
   a. Turkish or Osmanli.

CAUCASIAN FAMILY.

1. *Lesghian.*
2. *Circassian*, in 72 dialects.

BASQUE FAMILY.

1. *Basque or Euskara* (with Spanish group and French group).

SEMITIC FAMILY.

1. *Hebrew.*

BIBLIOGRAPHY. Sources of information on the ethnology of Europe are abundant. Ripley compiled, as a supplement to his *Races of Europe*, a bibliography of two thousand titles arranged by authors and by topics. The official publications of anthropological societies pay great attention to literature on all branches of this subject. The principal serials are the *American Anthropologist* (Washington); *Annales de Démographie* (Paris); *Anthropologie* (Paris); *Archiv für Anthropologie* (Brunswick); *Archivio per l'Antropologia* (Florence); *Beiträge zur Anthropologie und Urgeschichte Bayerns* (Munich); *Bulletins de la Société d'Anthropologie de Paris* (Paris); *Centralblatt für Anthropologie, Ethnologie und Urgeschichte* (Munich); *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (Brunswick); *Journal of the Anthropological Institute of Great Britain and Ireland* (London); *Mémoires de la Société d'Anthropologie de Paris* (Paris); *Memoirs Read Before the Anthropological Society of London* (London); *Mittheilungen der anthropologischen Gesellschaft in Wien* (Vienna); *Petermanns Mittheilungen aus Justus Perthes geographischer Anstalt* (Gotha); *Revue d'Anthropologie* (Paris); *Revue Mensuelle de L'Ecole d'Anthropologie de Paris* (Paris); *Revue d'Ethnographie* (Paris); *Verhandlungen der Berliner Gesellschaft für Anthropologie*, its organ being the *Zeitschrift für Ethnologie* (Berlin).

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EU'ROPHEN. An amorphous yellow powder containing about 22 per cent. of iodine, which it sets free under the influence of heat and moisture. Its action is similar to that of iodoform, to which it is preferred on account of its rather aromatic odor. It is insoluble in water, but dissolves freely in alcohol, ether, chloroform, and oils.

EURO'TAS (Lat., from Gk. Εὐρώτας), now IRI. A river of southern Greece, rising in the southern Arcadian Mountains and flowing in a southerly direction through Laconia, traversing the fertile valley between Mount Malevo and Taygetus, and falling into the Gulf of Laconia (Map: Greece, D 5). The cities of Sparta and Amyclæ were situated on the Eurotas, which were celebrated in Greek mythology.

EU'RUS (Lat., from Gk. Εὖρος). The east, or rather southeast, wind; in later Greek legend, the son of Astræus and Eos.

EURYALE, ů-rĭ'*a*-lê (Neo-Lat., from Gk. εὐρύαλος, *euryalos*, with wide threshing-floor, from εὐρύς *eurys*, broad + ἅλως, *halōs*, threshing-floor). A genus of plants of the natural order Nymphæaceæ, or water-lilies, closely allied to Victoria (q.v.), although of a very different appearance. *Euryale ferox*, the only species, is a water-lily native to India and China, with small red or violet-colored flowers, leaves from one to four feet in diameter, the leafstalks and calyces covered with stiff prickles. The fruit is round, soft, pulpy, and of the size of a small orange, composed of a number of carpels, and containing round black seeds as large as peas, which are full of starch, and are used to thicken soups or are eaten roasted. The rootstock also contains starch, which may be separated and used for food; the root itself is also eaten. The plant, which is said to have been in cultivation in China for upward of 3000 years, is more hardy than the Victoria regia, and will endure the temperatures of the latitude of Philadelphia, reproducing itself from self-sown seeds in ponds. The whole plant is formidably spiny, whence its specific name, ferox.

EURYBIADES, ů'rĭ-bī'*a*-dêz (Lat., from Gk. Εὐρυβιάδης). A Spartan naval hero. He was in command of the Spartan fleet, and afterwards nominal commander of all the Greek vessels sent out against the Persians in B.C. 480. To him is credited the Greek victory of Salamis, for which he was awarded the first prize, Themistocles receiving the second.

EU'RYCLE'A (Lat., from Gk. Εὐρύκλεια, *Eurykleia*). A slave in the household of Laërtes and the nurse of Odysseus. On his return in the garb of a beggar she recognized him by a scar while washing his feet, and secretly reported his return to Penelope.

EURYDICE, ů-rĭd'ĭ-sê (Lat. from Gk. Εὐρυδίκη, *Eurydikē*). The wife of Orpheus. She died from the bite of a serpent, and her husband followed her into the lower world, where he so charmed Hades with the music of his lyre that he was permitted to take Eurydice back to earth on condition that while on his way he would not look behind him. Just as he reached the exit he disobeyed, and Eurydice vanished into the darkness. Hermes, Orpheus, and Eurydice are represented on a very beautiful Greek relief of the end of the fifth century B.C., of which copies are in Naples, Paris, and Rome.

EURYL'OCHUS (Lat., from Gk. Εὐρύλοχος). One of the companions of Odysseus. He alone escaped when the others were turned into swine by Circe. On the island of Thrinacia he induced his companions to slaughter the cattle of Helios, which resulted in the destruction of all the ships.

EURYM'ACHUS (Lat., from Gk. Εὐρύμαχος). The son of Polybus, and one of the boldest of the suitors of Penelope, slain with the other suitors by Odysseus.

EURYNOME, ů-rĭn'ô-mê (Lat., from Gk. Εὐρυνόμη). The daughter of Oceanus and mother by Zeus of the Charities, or of Aropus. She was the wife of the Titan Ophion, who ruled Olympus, but with his wife was cast down to Tartarus by Cronus. She had a temple at Phigalia, where her statue—half woman, half fish—was preserved, and where she was popularly identified with Artemis.

EURYP'TERUS (Neo-Lat., from Gk. εὐρύς, *eurys*, broad + πτερόν, *pteron*, wing). An extinct arthropod, allied to the king-crab (Limulus), and found fossil in rocks of Ordovician to Permian age, in both North America and Europe. See KING-CRAB.

EURYP'YLUS (Lat., from Gk. Εὐρύπυλος). (1) King of the Meropes in Cos, and son of Poseidon and Astypalæa. He was killed by Heracles, with the assistance of Zeus. His daughter Chalciope became by Heracles the mother of Thessalus. (2) The son of Telephus and Astyoche, sister of Priam. He went to the aid of the

Trojans, and after heroic deeds was slain by Neoptolemus. (3) The son of Euæmon, King of Ormenium, in Thessaly, and one of the suitors of Helen. He went to Troy with forty ships, and received as his share, at the division of the Trojan booty, a chest preserved by Dardanus, which contained an image of Dionysus, the work of Hephæstus himself. On opening the box Eurypylus was struck with madness, for the cure of which the Delphic oracle directed him to dedicate the chest where he should find an unknown form of sacrifice. On his return he found at Aroë, in Achaia, an unusual sacrifice to Artemis, consisting of the annual offering of a beautiful youth and maiden. Having abolished this worship, he substituted that of Dionysus Æsymnetes.

EURYSTHENES, û-rĭs′the̱-nêz (Lat., from Gk. Εὐρυσθένης). One of the Heraclidæ, the son of Aristodemus. With his twin brother Procles he received Lacedæmon as his share of the Peloponnesus, and ruled at Sparta in conjunction with his brother. Thirty-one kings of Sparta were of his family.

EURYS′THEUS (Lat., from Gk. Εὐρυσθεύς). A king of Mycenæ, to whose power Heracles was subjected by the craft of Hera and forced to undertake the Twelve Labors. Eurystheus was afterwards defeated and killed by Hyllus, the son of Heracles.

EUSE′BIAN CANONS. An ancient system of cross-reference to the Gospels, found in very many biblical manuscripts. Long before the modern chapter and verse divisions came into use, a number of systems of text-division were current. The one most generally used was that of Eusebius, the famous Church historian (c.260-340). Either adopting or improving the work of Ammonius, an Alexandrian, Eusebius divided Matthew into 355 sections, Mark into 236, Luke into 342, and John into 232, the so-called Ammonian Sections, the number of each section being written on the margin of the text. On account of similarity of matter, many sections of one Gospel were nearly or quite identical with others in one or more of the other three. For convenience of reference, Eusebius constructed ten tables or lists, called canons. The first contained the numbers of all the sections common to all four Gospels arranged in parallel columns. The second, third, and fourth tables gave the sections common to three Gospels. The fifth to the ninth gave those common to two, while the tenth was made up of those contained in but one Gospel.

In manuscripts using the system, underneath each section number was written in red ink the number of the canon in which that section might be found. For example, the first line of canon i. contained the section numbers 8, 2, 7, 10—that is, the eighth section of Matthew contained the same matter as the second of Mark, the seventh of Luke, and the tenth of John. Hence, on the margin of the text of Matthew, opposite the eighth section, would be the figures (Greek letters being used) $\frac{\text{H}}{\Lambda}\left(=\frac{8}{1}\right)$, indicating that this section would be found in the first canon, and similarly for all the sections in all the Gospels. This widely used system was doubtless of great convenience in New Testament study. Consult Tischendorf, *Prolegomena* to the eighth edition of his Greek New Testament (Leipzig, 1884).

EUSE′BIUS (Lat., from Gk. Εὐσέβιος) OF CÆSAREA (c.260-c.340). The father of ecclesiastical history. He was born in Palestine about 260. He took the surname of Pamphili from his friend and teacher, Pamphilus of Cæsarea, whom he faithfully attended through his two years' imprisonment (307-09) during the persecution under Maximinus. Pamphilus ultimately met a martyr's death, and Eusebius had to flee for his life. He went to Egypt and was imprisoned there. In 313 he succeeded Agapius as Bishop of Cæsarea. At the Council of Nicæa (325) Eusebius made the opening address, and was the leader of the semi-Arian or moderate party, who were averse to discussing the nature of the Trinity and preferred the simplicity of Scripture language to the metaphysical distinctions of either side. He was present at the synods of Antioch (330) and Tyre (335), and showed marked Arian leanings. He stood in high favor with Constantine, who, it is said, declared that he was fit to be the bishop of almost the whole world. He died at Cæsarea about 340. Eusebius has the reputation of being the most learned of the Church fathers after Origen. His chief works are: (1) The *Chronicon*, a history of the world down to the celebration of Constantine's *Vicennalia* at Nicomedia and Rome in 327-28. It is particularly valuable for its extracts from old writers. (2) The *Præparatio Evangelica*, in 15 books, a collection of extracts from heathen authors fitted to prepare the way for Christianity. (3) The *Demonstratio Evangelica*, in 20 books, a work intended to convince the Jews of the truth of Christianity from the evidence of their own Scriptures. (4) The *Historia Ecclesiastica*, in 10 books, relating the principal occurrences in the Christian Church to the year 324. Unfortunately Eusebius omits all account of the wickedness and dissensions of Christians, considering such matter not edifying. Eusebius's complete works are in Migne, *Patrologia Græca*, xix.-xxiv. The *Præparatio* and *Demonstratio* were edited by Dindorf (Leipzig, 1867-71); the *Ecclesiastical History, Life of Constantine*, and *Oration in Eulogy of Constantine* by Heinichen (Leipzig, 1868-70); the *Chronicon* by Schöne (Berlin, 1867-75). Critical editions of the *Life of Constantine* and *Ecclesiastical History* are announced in the series *Griechische christliche Schriftsteller der ersten drei Jahrhunderte* (Leipzig, 1902-03). There is an English translation of the *History*, by A. C. McGiffert, in the *Nicene and Post-Nicene Fathers* (2d series, New York, 1890), with prolegomena and elaborate notes. Translations of some of the minor works also appear in the same volume. Consult: Schöne, *Die Weltchronik des Eusebius in ihrer Bearbeitung durch Hieronymus* (Berlin, 1900), and for a critical discussion of the text of the *Martyrs*, Violet (Leipzig, 1896) and Harnack (Essen, 1898).

EUSEBIUS OF EMESA (c.300-59). A Semi-Arian bishop. He was born at Edessa, about 300. He was a pupil of Eusebius of Cæsarea, and also studied at Alexandria. Averse to theological controversy, he declined the bishopric of Alexandria after the deposition of Athanasius. Later, however, he was appointed Bishop of Emesa (the modern Homs), and filled the post, notwithstanding opposition, sometimes violent, on account of his semi-Arian sympathies. He was also accused of Sabellianism. (See Sabellius.) He was a favorite of the Emperor Constantius, accompanied him on his expedition against the Persians in 338, and spent much of his time thereafter in attendance upon the Emperor. He died at Antioch in 359. His reputed works are in Migne, *Patrologia Græca*, lxxxvi., and his homilies were published by Augusti (Elberfeld, 1829). Many of these are undoubtedly spurious. Consult Thilo, *Ueber die Schriften des Eusebius von Alexandrien und des Eusebius von Emesa* (Halle, 1859).

EUSEBIUS of Nicome′dia (?-342). An Arian leader, Patriarch of Constantinople. He was born toward the close of the third century, and was related to the Imperial family. He was educated in the schools of Antioch, Arius being a fellow-pupil. He became Bishop of Berytus (Beirut), in Syria, and later of Nicomedia. At the Council of Nicæa he appeared as a defender of Arius, and, like his namesake, of Cæsarea, advocated compromise. Later he placed himself at the head of the Arian party. In 339 he was made Patriarch of Constantinople. In 341 he held an assembly of the Church at Antioch, for the purpose of establishing Arianism. He died in 342. Eusebius is said to have been ambitious and avaricious, and unscrupulous in the means adopted to secure his ends. It must be borne in mind, however, that no writings of the Arian party are preserved, and all our knowledge is from their opponents, the orthodox party. The Arians are sometimes called Eusebians.

EUSEBIUS EM′MERAN. See Daumer, Georg Friedrich.

EUSKALDUN, ū′skȧl-dōōn′. See Basque.

EUSKIRCHEN, ois′kĭr-ken. A town and railway junction, capital of a circle in the Rhine Province, Prussia, 15 miles west of Bonn. It is a thriving industrial centre; it has cloth manufactures, steam mills, and breweries. Population, in 1900, 10,285.

EUSTACHIAN (ṷ-stā′kĭ-*a*n) **TUBE.** See Ear.

EUSTACHIO, ā-ōōs-tä′kė-ō, Bartolommeo (?-1574). An Italian anatomist, born in the early part of the sixteenth century. His birthplace is not known with certainty. In 1562 he was professor of medicine in the Collegio della Sapienza at Rome. His name is indelibly associated with anatomical science, through his discoveries of the Eustachian tube (see Ear) and the rudimentary valve in the heart, which are named after him. He was the first to give an accurate description of the thoracic duct, and was probably the first to notice and describe the stapes (one of the chain of small bones crossing the tympanic cavity of the ear)—a discovery which, however, Fallopius assigns to Ingrassias. He likewise contributed materially to the diffusion of more accurate knowledge regarding the development and evolution of the teeth and the structure of the kidney. These discoveries are recorded in his *Opuscula Anatomica*, published at Venice in 1563. The *Tabulæ Anatomicæ* did not appear until 1714, when they were edited, with explanatory remarks, by Lancisi. Eustachio, Vesalius, and Fallopius may be regarded as the founders of modern anatomy. See Anatomy.

EUSTACHIUS, ṷ-stā′kĭ-ŭs, or **EUSTATHIUS**. A Roman saint and martyr of the second century. According to the legend, his name was Placidus. The legend adds that he was converted, while engaged in the chase, by suddenly beholding between the antlers of a deer a vision of Christ, which thus addressed him: "Why dost thou follow me, who desire thy salvation?" He suffered martyrdom in Rome under Hadrian, and is regarded by the Roman Catholic Church as the patron of the chase. His day is September 20th.

EUSTA′THIUS (Lat., from Gk. Εὐστάθιος) of Antioch (?—c.340). A Bishop of Antioch, born at Side, Pamphylia. At the Council of Nicæa he was exceedingly hostile to the Arians, in consequence of which he was deposed (331) upon their accession to power. He was subsequently banished to Illyria, and finally to Thrace, where he died. Only a work against Origen and a few fragments of other volumes remain of his numerous writings.

EUSTATHIUS ?-c.380). A Semi-Arian bishop of Sebaste, in Armenia, into which country he introduced monasticism. The ascetics known as Eustathians are supposed to have derived their name and their religious practices from him. He was also the founder of a hospital for the poor at Sebaste, which he placed in charge of his friend Ærius. Although constantly attacked by the orthodox churchmen, he retained his see, through the friendship of Constantine, until after 366.

EUSTATHIUS. A celebrated Byzantine commentator on Homer, Dionysius the Periegite, and Pindar. He was born probably at Constantinople in the early part of the twelfth century; became a monk, later a deacon in the Church of Saint Sophia, and in 1175 was appointed Archbishop of Thessalonica, where he died between 1192 and 1194. He is best known for his great commentary on the *Iliad* and the *Odyssey*, which, in spite of its diffuseness and digressions, is a valuable treasure house of ancient learning; but since the discovery and publication of the Homeric Scholia its importance has been much diminished. His chief sources were the extant Homeric Scholia, rhetorical lexica, Suidas, the Etymologicum Magnum, Athenæus, Ælius Dionysius, Aristophanes of Byzantium, Pausanias, Stephanus of Byzantium, Suetonius, and Heraclides of Miletus. It was first published in Rome in 1542; last edition by Stallbaum (7 vols., Leipzig, 1825-30). The paraphrase and commentary to *Dionysius the Periegite* is of little value. It is best published by Bernhardy, in his edition of *Dionysius* (Leipzig, 1828). Of the commentary to *Pindar* only the introduction on the life of the poet is preserved, and this is edited with commentary by Schneidewin (Göttingen, 1837). Eustathius also left a considerable number of historical writings, speeches, and tracts, important for a knowledge of his times, and of the inner history of the Greek monasteries in the twelfth century. Of these the greater part are published in Migne, *Patrologia Græca*, vols. 135 and 136. Consult Krumbacher, *Byzantinische Litteraturgeschichte* (Munich, 1897).

EUSTATHIUS, or **EUMATHIUS**, also known as Makrembolites. A Byzantine erotic writer or novelist of the twelfth century A.D. He seems to have been a native of Parembole in Egypt, and is referred to in the manuscripts of his work as chief keeper of the archives there. The novel by him is probably the latest Greek production of its kind known. It consists of eleven books, and is a story of the love of Hysminias and Hysmine (published in the *Scriptores Erotici* of Le Bas, Paris, 1856; also by Hercher, Leipzig, 1859, and by Hilberg, Vienna, 1876). The style of the novel is somewhat artificial, and the story decidedly improbable and of a very sensual character.

EUSTATIUS (ů-stā′shĭ-ŭs) **ISLAND,** or SAINT EUSTACHE ISLAND (Statia). One of the Lesser Antilles, lying northwest of Saint Christopher, belonging to the Dutch (Map: West Indies, Q 6). The chief town is Orangetown. It has an area of seven square miles and a population of about 1500.

EUS′TIS, JAMES BIDDLE (1834-99). An American lawyer and legislator. He was born in New Orleans, graduated at the Harvard Law School in 1854, and was admitted to the New Orleans bar in 1856. During the Civil War he served in the Confederate Army as judge-advocate on the staffs of Generals Magruder and Johnston, and afterwards was one of the commissioners sent by Louisiana to confer with President Johnson with regard to the 'reconstruction' of that State. He served for several terms in the State Legislature, and was afterwards twice sent to the United States Senate, serving from 1877 to 1879, and again from 1885 to 1891. From 1879 to 1884 he was professor of civil law in the University of Louisiana, and from 1893 to 1899, after his second term in the Senate, was United States Minister and first United States Ambassador to France.

EUSTIS, WILLIAM (1753-1825). An American physician and politician. He was born at Cambridge, Mass.; graduated at Harvard in 1772, and served as a surgeon in the Revolutionary Army. He served two terms in Congress as a Democrat; was Secretary of War in President Madison's Cabinet from 1809 to 1813, and was Minister to Holland from 1814 to 1818. On his return he was again a member of Congress from 1820 to 1823, and from 1823 until his death was Governor of Massachusetts.

EU′TAW. A town and the county-seat of Greene County, Ala., about 90 miles southwest of Birmingham, on the Alabama Great Southern Railroad (Map: Alabama, B 3). It is the centre of an agricultural district. Eutaw, established in 1838, was named in honor of General Greene's victory at Eutaw Springs in the Revolution. Population, in 1890, 1115; in 1900, 884.

EUTAW SPRINGS, BATTLE OF. A battle of the American Revolution, fought on September 8, 1781, about 60 miles northwest of Charleston, S. C., between about 2000 Americans under General Greene and about 2300 British under General Stuart. The battle consisted of two engagements, in the first of which, beginning at about 4 A.M., Greene was victorious; while in the second, the British, having rallied, beat off all further attacks. During the night, however, Stuart retreated toward Charleston, and Greene slowly pursued. The battle, though tactically drawn, was an important strategic victory for the Americans, closing, as it did, Greene's famous campaign and compelling the British to shut themselves up in Charleston. The British lost in killed, wounded, and missing about 800 men, the Americans about 535.

EUTERPE, ů-tẽr′pê (Lat., from Gk. *Εὐτέρπη*, very delightful, from *εὖ*, *eu*, well + *τέρπειν*, *terpein*, to rejoice). One of the nine Muses, the daughter of Zeus and Mnemosyne. In the specialization of the functions of the Muses, which occurred in Royal times, Euterpe was made guardian of flute-playing, and represented holding a flute.

EUTHANASIA, ū′thȧ-nā′zhĭ-ȧ (Neo-Lat., from Gk. *εὐθανασία*, easy death, from *εὖ*, *eu*, well + *θάνατος*, *thanatos*, death, from *θανεῖν*, *thanein*, to be dead). An easy death, or a painless method of putting to death. The use of narcotics or other means for shortening life, in disease, has become a subject of discussion in civilized countries; and it is often a very practical question as to how far such means are admissible for soothing the last hours of life, when the approach of death does not of itself dull the consciousness and the sensibility to pain. It must be decided according to all the surrounding circumstances, medical and otherwise, in each individual case.

EUTHE′RIA. A subclass of the Mammalia, embracing all mammals except the monotremes (*Prototheria*). This subclass is characterized by being viviparous, with a small ovum and an allantoic placenta, and by having teats. Whether certain of the most primitive fossil remains, more or less doubtfully attributed to the Mammalia, are to be placed here or among the Prototheria, is still a subject of inquiry. Consult Beddard, "Mammalia," in *Cambridge Natural History*, vol. x. (London, 1902). See MAMMALIA.

EUTHYM′IUS (Lat., from Gk. *Εὐθύμιος*) **ZYGADENUS** (?-c.1118). A Greek monk and scholar. He was highly esteemed by the Emperor Alexis Comnenus, and wrote some very dry theological works; the principal one, an enumeration of all the heresies from Simon the Magician to his own time — *Πανοπλία Δογματική* (first Latin edition in 1555, and an imperfect Greek edition in 1711). His works were printed in Migne, *Patrologia Græca*, vols. cxxviii. and cxxxi. (Paris, 1864).

EUTING, oi′tĭng, JULIUS (1839—). A German Orientalist and epigraphist. He was born at Stuttgart, and studied theology and Oriental languages at Tübingen (1857-62), Paris, London, and Oxford (after 1864). In 1871 he was appointed chief librarian at the Imperial University and Government Library at Strassburg, and in 1900 was made director of that institution. As a result of his frequent travels in Europe and the Orient, he accumulated a vast number of ancient Semitic inscriptions, chiefly in the form of impressions and drawings, which he gave to the University of Strassburg. His publications include: *Sechs phönikische Inschriften aus Idalion* (1875); *Nabatäische Inschriften aus Arabien* (1885); *Sinaitische Inschriften* (1891).

EUTRO′PIUS. A Latin historian, concerning whom we know only that he filled the office of secretary to the Emperor Constantine, fought under Julian against the Persians, and was still alive in the reign of Valens. The date of his death is unknown. His *Breviarium ab Urbe Condita*, giving a short narrative of Roman history from the foundation of the city to the time of the Emperor Valens, is written in an extremely simple and pure style, and appears to have been originally intended for the use of schools. An edition, with enlargements, however, was published by Paul, son of Warnefrid and Theodolinda, generally known as Paulus Diaconus. Others continued it down to the year 813. The history existed in three distinct forms at the revival of letters. There was first the genuine work of Eutropius in ten books; second, the expanded editions of Paul; and third, a very complete but also largely interpolated copy contained in the *Historia Miscella*. The *editio princeps*, printed at Rome in 1471, was from the impure text of Paul. The best modern editions are those of Droysen (Berlin, 1879) and Ruehl (Leipzig, 1887).

EUTROPIUS (?-399). Minister of the Emperor Arcadius. He was a eunuch and came originally from Armenia. He subsequently became attached to the Imperial Court, and gained the favor of his master by bringing about the marriage of the latter with Eudocia, by whom he was installed as the successor of the minister Rufinus (395). He was the chief adviser of Arcadius, and became notorious for his cruelty and avarice. In 397 he procured the enactment of the law of Arcadius against treason (intended to guard against a popular uprising, and later embodied in the codes of Theodosius and Justinian), which provided that in cases of high treason even the children of the accused were to be punished. He was deposed in 399, exiled to the island of Cyprus, and subsequently beheaded.

EUTRYCHIANUS, û-trĭk′ĭ-ā′nŭs. Bishop of Rome, 275-283, as reckoned among the popes. He is said to have been a martyr. His day is December 7th.

EUTYCHES, û-tī′kêz (Lat., from Gk. Εὐτυχής). A monk of the fifth century, archimandrite of a cloister near Constantinople, who in his old age taught views respecting the nature of Christ which were condemned as heretical. He possessed little education, but was fond of doctrinal controversy, in which the whole Church at that time was engaged. His peculiar teaching was a development of the Alexandrian Christology. He held that two natures, one divine and one human, went to make up the person of Christ, but that after their union in the incarnation there was only one nature. He was unwilling even to admit that Christ's physical body was like that of ordinary men. Thus his theory tended to dissolve the true humanity in the divinity of Christ.

At a synod held at Constantinople in 448, under Flavian, Bishop of Constantinople, Eutyches was charged with heresy by Eusebius of Dorylæum, and condemned. Under Alexandrian influence the Emperor was persuaded to summon a council which should review the case of Eutyches. This council met at Ephesus in 449, and is known as 'The Robber Synod,' from the riotous character of its proceedings. (See Ephesus, Councils of.) By the aid of armed soldiers and excited monks, Flavian was condemned and Eutyches rehabilitated. But the Church at large properly refused to recognize as final the verdict of this disgraceful assembly, and a change in emperors made its reversal politically possible. Under Pulcheria and Marcian the fourth ecumenical council was held at Chalcedon (451), and there the doctrine of the two natures in Christ was declared to be an article of the Catholic faith. Eutychianism was again condemned, and Eutyches himself, now seventy-three years old, was excommunicated and banished. We hear of him for the last time two years later, when he was still in exile. His followers continued their separate existence for a time, having monasteries of their own, but were soon lost sight of among the Monophysites (q.v.), who composed a large majority of the Eastern Church. See Leo I., and consult: Hefele, *History of the Councils*, iii. (Eng. trans., London, 1883); Harnack, *History of Dogma*, vol. iv. (Eng. trans., London, 1898); Du Bose, *The Ecumenical Councils* (New York, 1897).

EUX′INE (Lat. *Euxinus*, from Gk. εὔξεινος, *euxeinos*, hospitable, from εὖ, *eu*, well + ξεῖνος, ξένος, *xeinos*, *xenos*, stranger). The name applied by the ancients to the Black Sea. It is said to have been called in very early times the *Axenos Pontos*, the *inhospitable sea*, by reason of the roughness of its waters and the wildness of the savage tribes that lived on its borders, but to have had its name changed after the Greek colonies were founded in that region. Possibly, however, we are to explain the name *Euxine* as a euphemism for *Axine*.

EVA, Little. The childish friend of Uncle Tom in Mrs. Stowe's *Uncle Tom's Cabin*. Her early death forms the most touching episode of the story.

EVAD′NE (Lat., from Gk. Εὐάδνη). The daughter of Iphis, King of Argos, celebrated for her love of her husband Capaneus, one of the seven heroes who attacked Thebes. Her husband was struck by the lightning of Zeus as he was scaling the walls of the city, and Evadne was burned alive on his funeral pyre.

EVAG′ORAS (Lat., from Gk. Εὐαγόρας). A king, or despot, of Salamis in Cyprus, a reputed descendant of Teucer. He became king in B.C. 410, and is described as being a just and wise ruler, who aimed to promote the welfare of his people. He cultivated the friendship of the Athenians, and, after the defeat of the Athenians at Ægos-Potami, offered Conon a place of refuge at his Court. Being attacked by the Persians, he allied himself with the Athenians and the Egyptians, but was in the end made tributary prince to the Persians. He was assassinated in B.C. 374, and was followed on the throne by his son Nicocles.

EVA′GRIUS (Lat., from Gk. Εὐάγριος, *Evagrios*) (c.536- ?). An early Church historian, surnamed Scholasticus. He was born at Epiphania in Cœle-Syria in 536 or 537. He was an advocate at Antioch and the legal adviser of the Patriarch Gregory. The Emperor Tiberius II. made him a quæstor, and Mauritius, the son of Tiberius, made him prefect. His influence and reputation at Antioch were great, and on the occasion of his second marriage he was given a public festival by the citizens. The date of his death is unknown. Evagrius wrote an *Ecclesiastical History* for the years 431-594, which has value not only for Church history, but also for secular. It is in Migne, *Patrologia Græca*, lxxxvi., and there is an English translation by Hanmer (London, 1577, reprinted in Bohn's *Ecclesiastical Library*). The Greek text with the scholia was edited by Bidez and Parmentier (London, 1898).

EVALD, Herman Frederik (1821—). A Danish novelist. The more noteworthy of his novels are: *Valdemar Krone's Youth* (1860), a story of Danish aristocracy; *The Nordby Family* (1862); *Johanne's Talk* (1865); *Charles Lyng* (1882), showing him at his best in the drawing of character; *The Swedes at Kronenberg* (1867); *Anna Hardenberg* (1880); *Clara Bille* (1892). The last three are historical novels and have found favor in German translations.

EVALD, Johannes (1743-81). The greatest lyric poet of Denmark, born at Copenhagen. His poetry, with an occasional bit of fiction, such as *The Temple of Fortune* (1764), and *Elegies* (1766) on the death of Frederick V. brought him deserved fame, and his *Adam and Eve* (1769) was up to that time the best poem in Danish, as his *Rolf Krage* (1770) was the first original Danish tragedy. His next decade was very productive in tragedy, comedy, and farce, and closed with a drama, *The Fishers* (1779), the noblest of his works, in which is the Danish national song "King Christian Stood by the Lofty Mast." Already his health was giving way, the excitement of the first performance of *The Fishers* was too much for him, and he died after some months of agony, cruelly neglected by his family, but solaced by his friends. The best edition of his *Works* is by Liebenberg (8 vols., Copenhagen, 1850-55), the best biographical study his own *Life and Opinions* (Copenhagen, 1792). For his biography, consult, also, Hammerich (Copenhagen, 1882) and Jorgensen (ib., 1888).

EVAN'DER (Lat., from Gk. Εὔανδρος, *Evandros*). According to Roman traditions, the son of Hermes by Carmenta or Tiburtis or Themis or Nicostrate. About sixty years before the Trojan War he is said to have led a Pelasgian colony from Pallantium, in Arcadia, to Italy, and to have landed on the banks of the Tiber, near the foot of the Palatine Hill. From his Arcadian home this settlement was named Palatium. Tradition represented Evander as having done much to civilize his neighbors, by introducing trades and also knowledge of music and writing. To him is also ascribed the introduction of the worship of the Lycæan Pan, with that of Demeter, Poseidon, and Heracles, though Heracles is also said to have introduced his own worship when entertained by Evander after his battle with Cacus. Vergil represents him as being still alive when Æneas arrived in Latium after the sack of Troy. Evander was worshiped both at Pallantium, in Arcadia, and at Rome. The story seems clearly devoid of any historical truth, and to be merely a late invention to explain some similarities of worship and customs which were thought to exist between Rome and Arcadia. Consult Schwegler, *Römische Geschichte* (Tübingen, 1867).

EVANGELICAL (from *evangelic*, Lat. *evangelicus*, Gk. εὐαγγελικός, *evangelikos*, pertaining to the Gospel, from εὐαγγέλιον, *evangelion*, gospel, from εὐάγγελος, *evangelos*. bringing good tidings, from εὖ, *eu*, well + ἀγγέλλειν, *angellein*, to announce). Properly, belonging to or based upon the Gospel, and hence applied to anything which is marked by the spirit of the Gospel of Jesus Christ. In popular use the term is employed by a portion of the Christian community to denote their own peculiar theological opinions, which are held to constitute the only true and complete expression of Christian belief. In England and Scotland dissenters have claimed to be more 'evangelical' than the established churches. In the United States the term is appropriated by the more orthodox sects to distinguish themselves from the liberal and rationalistic bodies. In Germany all Protestants call themselves Evangelical, in opposition to the Catholics. The modern orthodox-pietistic party in the German churches has made exclusive claim to the designation evangelical on the ground that they alone hold to the Gospel in its actual historic shape. In England, after the Methodist revival, those in the Established Church who shared in general its spiritual views formed a very numerous party, and called themselves evangelical, as distinguished from others who gave a more formal assent to Protestantism. Their great leader was Charles Simeon (q.v.). They have many sympathizers in the Protestant Episcopal Church in the United States, and belong to the Low Church party.

EVANGELICAL ALLI'ANCE. A voluntary association of Evangelical Christians belonging to various denominations and countries. It had its origin in a general and strong desire for a more practical union among Protestants to promote the cultivation of Christian fellowship and the extension of Christian faith. After full conference and correspondence the Alliance was formed in Freemason's Hall, London, August 19-23, 1846, at a meeting of about 800 persons, Episcopalians, Presbyterians, Independents, Methodists, Baptists, Lutherans, Reformed, Moravians, and others, representing England, Scotland, Ireland, Germany, France, Switzerland, the United States, and other countries. The following doctrinal articles were adopted, not as a binding creed, but simply as an expression of the points of faith considered essential among those who are embraced in the Alliance. (1) The divine inspiration, authority, and sufficiency of the Holy Scriptures. (2) The right and duty of private judgment in the interpretation of the Holy Scriptures. (3) The unity of the Godhead and the Trinity of the persons therein. (4) The utter depravity of human nature in consequence of the fall. (5) The incarnation of the Son of God, His work of atonement for the sins of mankind, and His mediatorial intercession and reign. (6) The justification of the sinner by faith alone. (7) The work of the Holy Spirit in conversion and sanctification. (8) The immortality of the soul, the resurrection of the body, the judgment of the world by our Lord Jesus Christ, with the eternal blessedness of the righteous and the eternal punishment of the wicked. (9) The divine institution of the Christian ministry and the obligation and perpetuity of the ordinances of baptism and the Lord's Supper. The organization thus commenced has since been extended throughout Protestant Christendom. Branch Alliances have been formed in Great Britain, Germany, France, Switzerland, Sweden, the United States, Australia, and among missionaries in Turkey, India, Brazil, and Japan. The American branch was organized in 1867. These national branches are related to each other as members of a confederation having equal rights. The whole Alliance appears in active operation only when it meets in general conferences having the character of Protestant ecumenical councils, but claiming only moral and spiritual power. These have already been held at London, 1851; Paris, 1855; Berlin, 1857; Geneva, 1861; Amsterdam, 1867; New York, 1873; Basel, 1879; Copenhagen, 1885; Florence, 1891. The United States branch held a national conference at Chicago in October, 1893. One of the most effective of the general conferences was that at New York in 1873. The visible results of the Evangelical Alliance may be seen, in part, in its promotion of religious liberty wherever that has been restricted or assailed. Since its organization several cases of persecution have occurred in southern Europe under the operation of penal laws against Protestants. In these cases the influence of the Alliance has been successfully exerted to bring the persecution to an end. It has aided in bringing about changes in favor of religious liberty in Turkey, Sweden, the Baltic Provinces of Russia, and Japan.

EVANGELICAL ASSOCIATION. A religious denomination formed originally among the Germans of Pennsylvania. It has grown and extended till it is represented in most parts of the United States and Canada, and has gained a solid footing in Germany and Switzerland. Its founder, Jacob Albright, was born in Pennsylvania, in 1759, and was a member of the Methodist Episcopal Church. Observing the low condition of religious life among the German population around him, he undertook a work of reformation among them about 1790, and traveled as an evangelist. In 1800 he formed a class or society of his converts, which by 1807 had become large enough to make some organization desirable, and a conference was held at which Albright was unanimously elected bishop. He died in 1808, leaving the association a growing body of much vigor. A book of discipline was published similar to that of the Methodist Episcopal Church, and the name Evangelical Association of North America was adopted. Annual conferences were formed, and the first General Conference, consisting of all the elders, was held in 1816, in Union County, Pa.

The doctrines and theology of the Evangelical Association are Arminian, and its twenty-one articles of religion do not differ in any essential point from the twenty-five articles of the Methodist Episcopal Church. Its government, polity, and methods of worship likewise closely resemble those of the Methodist Church, and it is represented in the Methodist Ecumenical Conferences. It has bishops, chosen by the General Conference for terms of four years; presiding elders, serving not more than four years consecutively in the same districts; classes, quarterly conferences, annual conferences, and the General Conference, the supreme judicatory, meeting every four years. The ministers are of two orders—deacons and elders—and the itinerant system prevails, the pastors being appointed to their stations from year to year, at the meetings of the annual conferences. In 1891 the Church suffered a division, the culmination of a controversy of several years' duration. Two bodies met, one at Indianapolis and the other at Philadelphia, each claiming to be the true and lawful General Conference, and regarding the other as spurious. Lawsuits resulted concerning titles to property, the final decision of which was given in favor of the party representing the majority, whose General Conference had been held at Indianapolis. The minority then withdrew and organized the United Evangelical Church. By this division the Evangelical Association lost about 40,000 members. In 1891, previous to the division, it had 26 annual conferences, 1227 itinerant and 619 local preachers, 150,334 church members, church buildings valued at $5,168,210, and a missionary income for the preceding year of $159,443. In 1901 it had 27 annual conferences, including two in Germany, one in Switzerland, and one in Japan; 1088 itinerant and 476 local preachers, 139,459 pupils in Sunday schools, church property valued at $6,125,430, and a total income for missions of $147,080. Besides its German elements, it has a relatively large English-speaking membership, and publishes English periodicals and English books. It has three bishops, with one vacancy in the episcopal office; a well-equipped publishing house at Cleveland, and another at Stuttgart, Württemberg; a biblical institute and a college at Naperville, Ill.; two seminaries; an orphan home at Flat Rock, Ohio; a charitable society; a missionary society, sustaining domestic missions and a foreign mission in Japan, and assisting the European churches; a Woman's Missionary Society; a Church Extension Society; a Sunday-School and Tract Union; and a Young People's Alliance, returning 33,626 members. Its periodicals are: *The Evangelical Messenger* (weekly); *The Missionary Messenger* (monthly); *Der Christliche Botschafter* (weekly); *Der Evangelische Missionsbote* (monthly); papers for Sunday schools and the young people, in English and German—all published at Cleveland; *Der Evangelische Botschafter* (weekly) and *Der Evangelische Kinderfreund* (weekly), published at Stuttgart, Württemberg. Consult: Plitt, *Die Albrechtsleuts* (Erlangen, 1877); W. Orwig, *History of the Evangelical Association* (Cleveland, 1858); Mrs. H. Bennett, *History of the Woman's Missionary Society of the Evangelical Association* (Cleveland, 1902).

EVANGELICAL CHURCH CONFERENCE (Ger. *Evangelische Kirchenkonferenz*). See EISENACH CHURCH CONFERENCE.

EVANGELICAL COUNSELS, or COUNSELS OF PERFECTION. A term signifying, among Roman Catholics, the recommendation of certain things which are not universally necessary to salvation, but which, on the basis of the words of Christ recorded in the Gospels, those who wish to attain perfection are advised to practice. The most important are those which form the basis of the monastic vows of poverty, chastity, and obedience.

EVANGELICAL UNION. The name assumed by a religious body constituted in Scotland in 1843 by the Rev. James Morison (q.v.), of Kilmarnock, and three other ministers, who had been separated from the United Secession Church for doctrinal views, of which the fundamental and determining article was the strict universality of the Saviour's atonement. They were soon joined by a number of ministers and churches of the Congregational Union of Scotland, and have since extended themselves considerably in Scotland and the north of England. In 1899 they reported between 90 and 100 churches and 712 ministers. Their Church government is independent, but many congregations have ruling elders. Consult Ferguson, *The History of the Evangelical Union* (Glasgow, 1876).

EVAN'GELINE. An exquisite idyllic poem by Longfellow, deriving its title from its heroine, and published in 1847. It is the story of two lovers, Gabriel and Evangeline, who are parted during the deportation of the Acadians by the British in 1755. The lovers vainly seek each other, but are brought together only at Gabriel's deathbed, after many years.

EVANGELIST (Gk. εὐαγγελιστής, *evangelistēs*, bringer of good tidings, from εὐαγγελίζεσθαι, *evangelizesthai*, to preach the Gospel, from εὐαγγέλιον, *evangelion*, gospel). A term which occurs in the New Testament, and designates one of the several phases of ministry that grew up with the work of the early Church (Acts xxi. 8; Eph. iv. 11; II. Tim. iv. 5). The service which it represented was of a missionary character, itinerating rather than local, pioneer rather than supplemental, its purpose being to carry the Gospel message to new parts, preparing the way with aggressive work for the more settled and organizing service which should follow, though not necessarily without a local centre for work, as Philip had in Cæsarea and Timothy in Ephesus.

In post-Apostolic times this service underwent a radical change, losing its missionary character and even its itinerant form; so that the term came to be used for those who, in public worship, read and explained the written Gospels, and for those who, apart from all connection with Church service, transmitted in writing the Apostolic teaching, coming finally to have exclusive reference to the writers of the four Gospels. This has continued to be its distinctive meaning, though it is also used to-day, somewhat in its earlier sense, to denote a preacher of the Gospel whose work is given specifically to awakening personal interest in religion and who is not permanently connected with any local field nor devoted to the usual service of the pastorate. Consult: Zöckler, "Diakonen und Evangelisten," in *Biblische und kirchenhistorische Studien* (Munich, 1893); Reville, *Les origines de l'episcopat* (Paris, 1895); Zahn, *Missionsmethoden im Zeitalter der Apostel* (Erlangen, 1886).

EVAN'GELISTA'RION (ML., from MGk. εὐαγγελιστάριον, book of selections from the Gospels, from Gk. εὐαγγέλιον, *evangelion*, gospel). A lectionary or service book of the Greek Church, containing the lessons taken from the Gospels for each day in the year. The custom of assigning to each day some portion or portions of Scripture as its appropriate reading was in vogue very early in the Eastern Church. In process of time usage in this respect became quite uniform, each day of the year having its special lesson from the Gospels and another from the Epistles or Acts. In addition to these regular daily readings, holy and saints' days had their own appropriate readings assigned. It was customary to mark, in red ink, in the text of New Testament manuscripts, where the appointed lessons began or ended, by the words or abbreviations αρχη or αρχ (=beginning) and τελος or τελ (=end), while on the margin or at the bottom of the page the day to which the lesson belonged was indicated. But more convenient for use were the books containing collections of the readings arranged in chronological order. If such a book included only Gospel lessons, it was called an Evangelistarion; if the lessons were those from the Acts and Epistles, the book was called a Praxapostolos. If the book included both, it was a Euchologia, or Book of Offices. Lists or tables of such readings were also in circulation, called Synaxaria. If a table was of the daily readings only, it was called an Eclogadion; if of the readings for saints' days only, it was called a Menology. Hundreds of manuscripts of Evangelistaria are in existence, some of them quite sumptuous. They date from the sixth century onward, and many are of considerable value for the textual criticism of the New Testament. Consult Scrivener, *Introduction to the Textual Criticism of the New Testament* (4th ed., London, 1894). See LECTIONARY.

EVANGELISTS, SYMBOLS OF THE FOUR. In Christian art of the fifth century, the symbols used for the authors of the four Gospels are: For Matthew, a man's face; for Mark, a lion; for Luke, an ox; for John, a flying eagle—all alluding to the four cherubim before the throne of God described in the *Revelation.* As developed later, Matthew is represented by a man holding a pen and scroll, looking over his left shoulder at an angel, who perhaps represents the dictator of the Gospel; Mark, by a man writing, with a winged lion at his side; Luke, by a man with a pen, looking over a scroll, and near by an ox or cow; John, by a young man, with an eagle in the background. Speculation as to the meaning of these symbols has little value. Consult Jameson, *Sacred and Legendary Art* (London, 1866).

EV'ANS, AUGUSTA JANE (1835—). An American author, born near Columbus, Ga. She was married to L. N. Wilson in 1868. Her works consist of a number of novels, popular in their time, such as *Inez: A Tale of the Alamo* (1856); *Beulah* (1859); *Saint Elmo* (1866); *Vashti* (1869); *At the Mercy of Tiberius* (1887); and *A Speckled Bird* (1902).

EVANS, CHRISTMAS (1766-1838). A Welsh Baptist preacher. He was born at Isgaerwen, Cardiganshire, on December 25, 1766. He was brought up among Presbyterians, but became a Baptist in 1788, and was ordained as a missionary among the Baptists in Carnarvonshire, 1789. In 1792 he removed to Anglesey, and till 1826 lived there, and virtually exercised episcopal functions over his brethren. His arbitrary and dictatorial conduct was offensive, and compelled his removal to Glamorganshire in 1826. In 1828 he went to Cardiff, and in 1832 to Carnarvon. He was familiar to all Welshmen by reason of his debt-raising journeys over the principality, and famous for his eloquence. He had the sight of only one eye. He died at Swansea, July 19, 1838. For his biography, consult Hood (New York, 1901).

EVANS, FREDERICK WILLIAM (1808-93). An American reformer. He was born in England, but came to the United States in 1820; was apprenticed to a hatter, and, in the intervals of his work, studied the writings of Owen, Fourier, and other social reformers, and became a thoroughgoing Socialist. After visiting the Shakers at Mount Lebanon, N. Y., he determined to join them, and soon became an elder and a recognized leader. By his teachings he modified the doctrines of the sect. Among his writings are: *Autobiography of a Shaker* (1869); *Religious*

Communism (1872); and *The Second Appearing of Christ* (1873).

EVANS, Sir George De Lacy (1787-1870). A British soldier and politician. He was born in Ireland; entered the British Army in 1807; was present, as lieutenant-colonel of infantry, at the capture of Washington, the attack on Baltimore, and the operations before New Orleans, in the War of 1812; and returned to Europe in time to fight under Wellington at Waterloo. He served in Parliament from 1833 to 1841, and again from 1846 to 1865, as a representative of the 'Advanced Liberals,' and in 1835 commanded the British Auxiliary Legion in Spain. In 1854 he was promoted lieutenant-general, and was selected to command the second division of the army sent to the Crimea, where he distinguished himself in the war against Russia.

EVANS, Henry Clay (1843—). An American politician, born in Juniata County, Pa. In 1864 he enlisted in the Forty-first Wisconsin Infantry, subsequently established manufactories of iron and railway-cars at Chattanooga, Tenn., and was twice elected Mayor of that city. From 1889 to 1891 he was a member of Congress, and from 1889 to 1893 Assistant Postmaster-General. In 1894 he was elected Governor of Tennessee in accordance with the original returns, but a recount having been made by the Legislature, certain returns were rejected on the ground of irregularity, and the Democratic candidate was therewith declared elected. At the National Republican Convention of 1896 he was second in the balloting for Vice-President, and in 1897 he was appointed United States Commissioner of Pensions, but resigned that office in 1902, and was appointed Consul-General at London.

EVANS, Hugh Davey (1792-1868). An American author. He was born in Baltimore; was admitted to the Baltimore bar in 1815, and attained eminence as a constitutional lawyer. He was prominent in the councils of the Protestant Episcopal Church; edited several religious newspapers between 1843 and 1858; and from 1852 to 1864 was lecturer on civil and ecclesiastical law in Saint James's College, Maryland. The most important of his numerous publications is his *Treatise on the Christian Doctrine of Marriage,* published posthumously in 1870. Consult Harrison, *Memoir of Hugh Davey Evans* (Hartford, 1870).

EVANS, Sir Hugh. A simple-minded Welsh parson, in Shakespeare's *Merry Wives of Windsor.* The mock duel that Falstaff and his friends arrange between this character and Dr. Caius is probably the prototype of the similar affair between Daw and La Foole in Jonson's *Epicœne.*

EVANS, Sir John (1823—). An English antiquary. He was born in Market Bosworth, Leicestershire, and was educated by his father. He made a fortune in paper manufacture, and thereafter devoted himself largely to collecting coins and antiquities. He was president of the Geological Society of Antiquaries from 1885 to 1892, of the Numismatic Society from 1875 to 1902, of the British Association for the Advancement of Science in 1897-98, and of the Egyptian Exploration Fund. His researches embrace the departments of geology, archæology, and numismatics, and his collection of coins ranks among the first in England. His principal publications include: *Coins of the Ancient Britons* (1864); and *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain* (1872), both of which have been translated into French.

EVANS, Mary Ann or Marian (1819-80). An English novelist, the author of *Adam Bede, Felix Holt, Middlemarch, Daniel Deronda,* etc. She wrote under the pseudonym George Eliot, and under this title her life and works are described. See Eliot, George.

EVANS, Oliver (1755-1819). An American inventor. He was born at Newport, Del., and in his early youth was apprenticed to a wheelwright, thus being afforded an opportunity of displaying uncommon inventive genius. When twenty-two years of age he invented a machine for making the wire card-teeth used in carding cotton and wool, which hitherto had been produced by hand work. He later invented improved machinery for flour-mills, which enabled the miller to make not only finer flour, but twenty pounds more to the barrel, at the same time cutting down the cost of labor one-half. Having invented a steam-engine, in 1786 he asked for a patent from the Legislature of Pennsylvania for its application to mill machinery and to the steam-carriage. Evans made the first high-pressure steam-engine, and the first steam dredging-machine used in the United States. This dredge, weighing about 4000 pounds, was put on wheels and propelled itself to the Schuylkill River, one and one-half miles distant, where it was connected to a stern paddle-wheel and navigated the Schuylkill down to its junction with the Delaware. This is supposed to have been the first actual propulsion of a carriage on land by steam in America. He designed and constructed an engine for a steam-vessel on the Mississippi River, but the boat in which it was to be mounted was never completed and the engine was installed in a sawmill, where it ran most successfully. He built many steam-engines and invented much new machinery, and has been termed the 'Watt of America.' He died in New York, April 21, 1819. Consult Thurston, *Growth of the Steam Engine* (New York, 1878).

EVANS, Robley Dunglison (1846—). An American naval officer, born in Virginia. He graduated at the United States Naval Academy in 1863; served in the West Indies, and participated, with the North Atlantic blockading squadron, in both attacks on Fort Fisher, and in the second was severely wounded. In 1866, however, he returned to the service as a lieutenant. He was lighthouse inspector (1882-86); commanded the *Yorktown* at Valparaiso (1891-92); was made captain in 1893; and in 1896 was transferred to the *Indiana,* the first battle-ship commissioned by the United States. Later, he was attached to the Lighthouse Board (1897), and during the war with Spain was in command of the *Iowa,* and took a prominent part in the battle of Santiago. At one time during the fight the fire of the entire Spanish fleet was concentrated on the *Iowa.* In 1898, at his own request, Evans was detached from the *Iowa,* and afterwards was made a member of the Board of Inspection and Survey. He was advanced to the rank of rear-admiral February 11, 1901. During the visit to the United States of Prince Henry of Prussia, in 1902, Rear-Admiral Evans was his escort, representing the navy. In 1901 he published a volume of interesting naval reminiscences, entitled *A Sailor's Log.*

EV'ANSTON. A city in Cook County, Ill., 12 miles north of Chicago, of which it is a popular suburb; on Lake Michigan, and on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads (Map: Illinois, E 1). It is beautifully situated on the lake, and is a well-known educational centre, the Northwestern University (q. v.) and the Garrett Biblical Institute being located here. Settled about 1835, Evanston was incorporated about 1890. Its government is administered by a mayor, elected biennially, and a unicameral city council. With the exception of the city treasurer and city clerk, who are chosen by popular election, all municipal officials are nominated by the mayor, with the consent of the council. The city owns and operates its water-works. Population in 1900, 19,259.

EVANSTON. A city and the county-seat of Uinta County, Wyo., in the southwestern part of the State; on the Bear River, and on the Union Pacific Railroad (Map: Wyoming, D 5). It is the seat of the State Institution for the Insane. The city is an agricultural and stock-raising and coal-mining district, and has some industrial establishments, the principal of which are railroad repair-shops. Oil has been found in the vicinity. Population, in 1890, 1995; in 1900, 2110.

EV'ANSVILLE. A city, port of entry, and county-seat of Vanderburg County, Ind., 180 miles southwest of Indianapolis; on the Ohio River, and on the Evansville and Terre Haute; the Louisville, Evansville and Saint Louis; the Louisville and Nashville, and other railroads (Map: Indiana, B 4). Coal abounds in the vicinity, and the city has a large trade in coal, timber, grain, pork, tobacco, and flour. The industrial plants include foundries and machine-shops, flouring-mills, furniture-factories, plow-works, and establishments for the manufacture of liquors, cotton and woolen goods, leather, etc. Among the more prominent buildings are the custom-house, court-house, city hall, United States Marine Hospital, State Hospital for the Insane, Evans (Temperance) Hall, and Willard Library. Other features of interest are Cooks, Mesker, and Garvin parks. The government is administered under a charter of 1893, which provides for a mayor, elected every four years, and a city council, the majority of the members of which are elected by wards, and the rest at large. All other officials, excepting the clerk of the city, who is chosen by the council, are appointed by the executive. The annual income of the city is about $940,000; annual expenditures, about $700,000. The principal items of expense are $50,000 for the police department, $55,000 for the fire department, and $170,000 for schools. The waterworks are owned by the city, the yearly cost of operation being about $30,000. Evansville was founded in 1816 by General Robert M. Evans, became the county-seat in 1819, and with a population of 4000 was incorporated as a city in 1847. Population, in 1890, 50,750; in 1900, 59,007.

EVAPORATION (Lat. *evaporatio*, from *evaporare*, to evaporate, from *e*, away + *vaporare*, to emit vapor, from *vapor*, vapor). The change of state from solid or liquid to gaseous. All substances emit vapors, and those which at ordinary temperatures evaporate rapidly are said to be volatile. If the vessel in which a liquid is allowed to evaporate be open, the vapor will diffuse through the air, and evaporation will go on until there is no more liquid left. But if a liquid is placed in an air-tight vessel, evaporation goes on until the vapor escaping from the liquid has attained a certain definite pressure within the vessel, and then a dynamic equilibrium is established; that is to say, evaporation will not really cease, but for every amount of liquid evaporated an equal amount of vapor will be condensed, and, as a result, the amount of vapor, and hence the pressure, will remain constant. This constant pressure, measuring the vapor-tension of the liquid, depends entirely on two factors—the nature of the liquid and the temperature at which it is kept. At the same temperature, different liquids have different vapor-tensions, and when the temperature is raised, the vapor-tension of each is increased by an amount depending, again, upon the nature of the liquid. When the vapor of a substance has attained its full pressure, it is said to be *saturated.* The full vapor-tension corresponding to a certain temperature is not attained instantaneously, since evaporation requires *time.* The rate of evaporation depends on a large number of circumstances, some of which are more or less accidental, i.e. have nothing to do with the nature of the liquid experimented upon. Thus the size, shape, and material of the vessel in which evaporation is allowed to take place have a considerable influence on the rate. Other factors are the temperature of the liquid itself, the density of the atmosphere above its surface, and the magnitude of the surface exposed, shallow vessels being employed when rapid and copious evaporation is required. In case the liquid is a mixture or a solution, the rate of evaporation depends greatly upon its composition and upon the nature of the several constituents.

The Heat of Evaporation. The temperature of pure boiling water remains constant; yet heat must be continually supplied to it in order that evaporation may go on; the heat does not appear as sensible heat, but is required to produce the change of state. The heat required to convert one gram of a substance into vapor is called its *heat of evaporation;* that required to convert one 'mol' into vapor is called the *molecular heat of evaporation.* (By a 'mol,' or gram-molecule, is meant a number of grams equal to the chemical reacting weight of the substance; thus a mol of water is 18 grams, 18 being the molecular weight of water, H_2O.) The number of substances whose heats of evaporation have been actually determined is as yet rather small. On the other hand, the laws of thermodynamics lead to methods that permit of calculating the heat of evaporation of a substance if certain other numerical data in connection with the substance are known. Thus, if the volume occupied by one gram of a liquid is V', and the volume occupied by one gram of a saturated vapor is V, the 'absolute temperature' being T (by the absolute temperature is meant the ordinary centigrade temperature increased by 273; thus the normal boiling-temperature of water on the absolute scale is $100° + 273° = 373°$), and if the increase in the vapor-pressure produced by a rise of 1° in temperature is denoted by the symbol $\frac{dp}{dT}$, then the heat of evaporation, *l*, may, according to Clausius, be calculated by the following formula:

$$l = T\,\frac{dp}{dT}\,(V - V')$$

At the critical temperature (see CRITICAL POINT) there is no difference whatever between a liquid and its vapor; the difference between the volumes occupied by one gram of liquid and one gram of vapor is naught, and the heat of evaporation is likewise naught, as is shown by the above formula.

COOLING BY EVAPORATION. Since the transformation of liquids into vapors involves the absorption of heat, a liquid may be cooled by allowing it to evaporate, while no heat is applied to it; the evaporation will then take place at the expense of the sensible heat of the liquid itself, and as a result the temperature will be lowered. Thus the rapid evaporation of liquid ammonia or of sulphurous acid produces temperatures low enough for water to freeze, and is employed in making artificial ice. Liquid ethylene evaporates rapidly and produces temperatures low enough for compressed air to be liquefied; the evaporation of the liquefied air thus obtained produces still lower temperatures, and in this manner the most refractory gases may be liquefied. When liquefied carbonic acid is forced, by the pressure of its own vapor, in a fine stream into the air, it evaporates so rapidly that a portion of the stream is frozen, forming a delicate snow-like mass.

Evaporation is continually going on in nature on a most gigantic scale. Vapor from the ocean is continually rising invisible in the air. Meeting with a colder stream of the atmosphere, or with a cold mountain ridge, it becomes condensed into mists or clouds. The fine particles of these unite into larger masses and fall as rain, hail, or snow, to be again evaporated by heat from the moist ground, or from rivers, lakes, and seas. See BOILING-POINT; VAPOR.

EV'ARTS, JEREMIAH (1781-1831). An American editor. He was born at Sunderland, Vt., graduated at Yale in 1802, and practiced law in New Haven. He was editor for some years of the *Missionary Herald*, and in 1821 was chosen corresponding secretary of the American Board of Commissioners for Foreign Missions. He was an efficient advocate and organizer of Christian missions, and took an active part in the movement to secure justice for the Indian tribes. Consult Tracy, *Memoirs of Jeremiah Evarts* (Boston, 1845).

EVARTS, WILLIAM MAXWELL (1818-1901). An eminent American lawyer and statesman. He studied at the Harvard Law School until 1839. In 1841 he was admitted to the bar. He was Deputy United States District Attorney from 1849 until 1851, and District Attorney from 1851 until 1853. In 1860 he attended the National Republican Convention in Chicago as the chairman of the New York delegation, and nominated Seward for the Presidency. During the Civil War he was secretary of the Union Defense Committee, and was sent by President Lincoln on a diplomatic mission to England. He was the senior counsel of President Johnson in the great impeachment trial of 1868 (see JOHNSON, ANDREW), and did much to secure his acquittal. From July, 1868, until March 4, 1869, he was Attorney-General of the United States. In 1872 he acted as chief counsel of the United States before the Geneva Court of Arbitration (q.v.). In the contest between Hayes and Tilden in 1877 for the succession to the Presidency, Evarts was the leading counsel of the Republicans before the Electoral Commission (q.v.). He was appointed Secretary of State by President Hayes, and served throughout the term. In 1881 he was sent as a delegate of the United States to the International Monetary Conference at Paris, and from 1885 to 1891 he served in the United States Senate. He then retired both from politics and from the bar, and lived in New York City until his death. Only a few of his public addresses have been published. Among these are the eulogy on Chief Justice Chase, delivered at Dartmouth in 1873; the Centennial oration delivered in Philadelphia in 1876; and his orations at the unveiling of statues in New York to William Seward and Daniel Webster.

EVE. The name given to the first woman, in Gen. iii. 20. The Hebrew form, *Hawwah*, is connected with the verb to live, and probably means life, or perhaps a living thing. In the passage it is explained that the name was given 'because she was the mother of all living.' Unlike Adam, Eve is unquestionably a proper name. The passage (Gen. ii. 18-25) in which the creation of Eve is related is assigned to the Yahwistic writer, and lays stress upon the close relation between Adam and Eve and between husband and wife. Verse 24 has been thought to reflect the primitive organization of society, where kinship is traced through the maternal line. See ADAM, and consult Robertson Smith, *Kinship and Marriage in Early Arabia* (Cambridge, 1885).

EVE, PAUL FITZSIMMONS (1806-77). An American physician. He was born in Augusta, Ga., and graduated at the University of Georgia in 1826 and at the University of Pennsylvania Medical College in 1828. He then studied in Europe for several years, and acted as surgeon in the Polish Revolution of 1831, receiving a cross of honor in recognition of his services. He was professor of surgery in several colleges in this country, and published a number of interesting papers.

EVECTION (Lat. *evectio*, a carrying upward, from *evehere*, to carry out, from *e*, forth + *vehere*, to carry). A lunar perturbation or inequality depending upon the alternate increase and decrease of the eccentricity of the moon's orbit. (See LUNAR THEORY.) Evection may change the moon's place as much as 1.25°, and alter the time of occurrence of an eclipse as much as six hours.

EV'ELYN, JOHN (1620-1706). An English author, born October 31, 1620, at Wotton, the family seat, Surry. Educated first at the free school of Lewes, he was afterwards for a short time at Balliol College, Oxford, and also studied at the Middle Temple. During the Civil War he found it prudent to pass much of his time on the Continent, though he served in the King's army for three days (1642), and lived in England for two years (September, 1647, to June, 1649). Returning to England in 1652, he settled at Sayes Court, Deptford, where he lived quietly, amusing himself with gardening till the Restoration. A trusted Royalist, he was much employed by the Government, though he was given no high office. He was one of the first and most valuable members of the Royal Society. In 1694 he removed from Sayes Court to Wotton, where he died, February 27, 1706. Evelyn wrote upon a great variety of subjects—art, architecture, gardening, and commerce. These works, of which there are about thirty, have little permanent value. His *Sylva, or a Discourse of Forest Trees*, was long a standard work. He owes his present celebrity to the *Diary*, which covers about seventy years, and these the most dramatic in the history of England. The book is of inestimable value. Scott said he had "never seen a mine so rich." The *Diary* was first published in 1818-19. The sixth edition, with *Life* by Wheatley, appeared in London (1879).

EVENING GROSBEAK. See GROSBEAK.

EVENING PRIMROSE. See ŒNOTHERA.

EVENING SCHOOLS. Schools found in England, the United States, and the leading Continental countries of Europe, whose principal object is to provide either elementary or special instruction for those who are unable to attend day schools on account of the necessity of earning a livelihood. They supply three classes of wants: (1) Primary instruction, for the illiterate, juvenile or adult; (2) vocational training, commercial or industrial; (3) the desire for some higher, liberal culture on the part of the masses generally, and especially of those who have enjoyed few or no opportunities for advanced instruction in the ordinary schools. The evening school, from being a place for mere primary instruction, is rapidly becoming more and more either a vocational or a higher-culture school. Such schools are the mechanical institutes and workingmen's colleges in England, the Prussian *Fortbildungsschulen*, the various classes of courses for adults, the evening work in the apprentice schools in France, and the evening high schools and such institutions as Cooper Union in the United States.

In Germany the evening schools may be said to spring from the old Sunday-schools, which in 1760 began to give, in addition to religious instruction, some training in primary work. Late in the eighteenth century cities took up the task of supplementing the somewhat meagre education that some of the poorer children had received, Berlin being the first to found a free school for manual workers. In 1844 the Prussian Cultusminister issued a circular calling attention to the need of such schools, but, although this was immediately followed by considerable activity in the matter, it soon languished. Eventually, however, their number increased, and their position became more definite. They extended the time of instruction to from four to eight hours a week, occupying evenings usually. With the rapid development of industrial and commercial life, and the elaboration of the school system, they turned more and more to giving instruction in technical and commercial matters. Their curriculum, originally confined to German and arithmetic, came to include elementary geometry and drawing, then history, geography, and natural science, with bookkeeping, correspondence, etc. These *Fortbildungsschulen* or continuation schools attempt to fit the course of study to the occupations of the school locality. Those in the cities are classified as industrial, while those in the country emphasize subjects of study relating to agriculture. They are often connected with schools for special trades or occupations, and in fact such schools are classified under continuation schools frequently. Many of them do not carry on their work in the evening. In Prussia, if we include the trade and commercial schools, there are over 3000 continuation schools at present, and in the rest of Germany about four times that number.

Although schools for the education of adults had existed in France as early as 1709, the notion of having evening schools for this purpose seems to have been introduced from England in 1820, when such an institution was established in Paris. After 1803 the movement was extended, and in 1867 there were 35,000 such classes in France. A decline in number followed, but recently they have again been on the increase, numbering, in 1897-98, 30,184. The classes for women are separate from those for men. The work is (1) for illiterates, or (2) a review of primary work, or (3) preparation for special vocations. To gain this last end these have a variety of kinds of instruction. In 1876 the *Comité d'encouragement des Etudes Commerciales* began the establishment of commercial evening schools, while the Société Polytechnique and the Société Philotechnique, founded in 1830 and 1848 respectively, are now offering evening instruction in commercial branches, industrial and constructive arts, and mathematics. In addition there is a considerable movement in the direction of University Extension courses, which are held in the evening. In general it may be said that the French evening schools do not attend quite so much to liberal and ethical training as do the German continuation schools, but emphasize more specific industrial and commercial work.

In England the first evening school proper for instructing boys and girls who had to work all day for a livelihood was founded in 1806 at Bristol by the Benevolent Evening Schools Society. The first school established exclusively for adults was in Bala, Merionethshire, in 1811, by the Rev. T. Charles. Similar schools were founded in Bristol in 1812, and in London in 1816. In a few years they existed in thirty towns. The Government began to grant for their support certain allowances out of the public fund for education. These were, however, very sparing until 1861, when a revision of the code permitted day-school teachers to teach in the evening schools. Aid to teachers was withdrawn, but capitation grants were made on the average attendance, and for successful examinations. The result was a great increase in the sums obtained for such schools as were devoted to review work, etc., and as also had paid certificated masters instead of voluntary ones. At the same time the schools devoted to illiterate adults were left largely to the care of private beneficence. This type of school, however, is becoming constantly less and less necessary, while the evening continuation school is developing into a more and more elaborate institution. Until 1890 its curriculum was confined to elementary subjects, and no aid was granted to pupils over twenty-one. At that time, however, and especially by the code of 1893, the course was enlarged, the attendance of persons over twenty-one recognized, and the method of granting money changed so as to recognize the work of the school as a whole, rather than the attainments of the individual pupil. The schools have, as a result, become largely secondary, and their attendance has steadily increased. In 1898 the attendance in England and Wales was 435,600 in 5535 schools. The subjects of study include elementary science and art, shorthand, bookkeeping, history, geography, and wood-carving, and, for girls, cookery and dressmaking. There are special science and art evening schools, giving instruction in advanced science with laboratory work and extensive practical work in art; also advanced commercial evening schools and evening institutes for women and girls, offering courses in cookery, needlework, nursing, etc. The University Extension movement has also become quite prominent, and evening classes are often provided. The evening continuation schools of Scotland have had about the same history as those in England. In Ireland the number of evening schools and the attendance thereat steadily declined between 1880 and 1897, and measures removing restrictions on attendance and enlarging the curriculum are necessary to their development.

In the United States evening schools were established at first largely to provide for children in the great cities who were occupied during the day. Attendance at them has been confined principally to older children and adults. They were tried in New York City in 1834, but failed for want of teachers. Fourteen years later the Public School Society successfully reëstablished them. Within two years they had 15 schools and 8000 pupils. The Boston evening schools were legally recognized in 1857. In 1898 there were evening schools in 138 cities having 8000 inhabitants or more. They were situated in 25 States, although 39 were in Massachusetts. The attendance was made up largely of pupils who did not attend day classes. In most cities the schools were kept open only a few months, and the work was inferior and inadequate. As a result the attendance did not increase rapidly, or even declined. The establishment of evening high schools, some of which emphasize commercial work, has come to remedy this situation, and the United States finds, as other countries have found, that secondary evening instruction is more in demand and more effective than that of the primary grade. In 1884 five large cities had evening high schools, and since then their number has steadily increased. In addition a variety of means has come into existence by which liberal and vocational instruction is given to people whose time is occupied during the day. Among the most notable are Maryland Institute, Baltimore, and Cooper Union, New York. The latter institution was incorporated in 1857. It furnishes advanced instruction in mathematics and the natural sciences, with applications to the various trades. There is a school of art also, in which attention is paid to the more mechanical of the fine arts, such as engraving, etc. The Young Men's Christian Associations also have established in some cities extensive lines of instruction, carried on mostly in the evening. Much of the University Settlement and University Extension work also occupies evening hours, and with them the account of the principal lines of evening instruction in the United States may be concluded.

The evening school exists also in European countries other than those already mentioned, as in Holland, Italy, and Switzerland. These nations have been called upon to deal with the same problems which have characterized the development of this school everywhere, and in solving which it has turned more and more toward vocational instruction and liberal studies in advance of the primary grade. Consult: Balfour, *The Educational Systems of Great Britain and Ireland* (London, 1900); Teegan, *Technical and Industrial Education in France* (London, 1892); *Reports of United States Commissioner of Education, passim.* See NATIONAL EDUCATION, SYSTEMS OF.

EVEN NUMBER. See NUMBER.

EVERDINGEN, ā'vẽr-dĭng-en, ALLART, or ALDERT VAN (1621-75). A Dutch landscape painter and engraver, born at Alkmaar. He was a pupil of Roelandt Savery and of Pieter Molyn, and lived in Haarlem and Amsterdam. In 1640-44 he sailed to the Baltic coast and Norway, and his subsequent landscapes show the impression made on him by northern scenery. His pictures usually represent waterfalls, with fir-trees and rocks. His treatment is fresh, spirited, and truthful, and his composition masterly. The color in his landscapes is at times dark, but in his better works it is clear and warm. Hardly less notable are his rarer marines. His best paintings include: "Landscape with River," in the Louvre; "Landscape with Waterfall," Munich; a similar subject in Berlin; and a Norwegian landscape in Amsterdam. He left more than 150 known etchings of great variety and spirit. Fifty-seven of these illustrate the poem of *Reineke Fuchs*. The original drawings for this work, and also others by him, are in the British Museum.

EV'EREST, MOUNT. A mountain of the Himalaya system on the frontier of Nepal and Tibet, situated in latitude 27° 59′ N., and longitude 86° 55′ E. (Map: India, E 3). It is the highest known mountain peak on the earth, being about 29,000 feet above sea-level, or approximately five and a half English miles. It was named after Sir George Everest, a former surveyor-general of India. Some geographers prefer to call it Gaurisankar, i.e. 'Mountain of the Gods,' after the native name.

EVEREST, Sir GEORGE (1790-1866). An English military engineer, born in Wales. He was employed in various engineering works in India, was assistant to the chief in the trigonometrical survey of that country, and on the chief's death became his successor. Afterwards he was surveyor-general of India. Mount Everest (q.v.) was named in his honor. He published *An Account of the Meridional Arc of India* (1847).

EV'ERETT. A city in Middlesex County, Mass., three miles north of Boston (Map: Massachusetts, E 3). It is on the Boston and Maine Railroad, and has electric railroad connection with Boston, Chelsea, Lynn, Salem, and towns of the vicinity. Everett is primarily a residential town, but has a number of manufacturing plants, the principal being chemical works, gas and coke works, structural iron foundries, and steel-works. There are two public libraries—the Parlin

Memorial and Shute Memorial—and the Whidden Memorial Hospital. The government is administered, under the original city charter of 1892, by an annually elected mayor and a bicameral city council, of which the members of the upper house are elected at large for two years, and those of the lower by wards for one year. Of the other municipal officials, the more important are nominated by the executive and confirmed by the board of aldermen, and those of less importance are chosen by the city council. The school board is elected at large. Population, in 1890, 11,068; in 1900, 24,336. Everett was settled in 1643 and remained a part of the town of Malden till 1870. It was chartered as a city in 1892, and had a rapid growth during the last decade of the nineteenth century.

EVERETT. A city and the county-seat of Snohomish County, Wash., 33 miles north of Seattle; on Puget Sound, and on the Great Northern, the Northern Pacific, and the Everett and Monte Cristo railroads, and the Pacific Coast Steamship Line (Map: Washington, C 2). It was settled in 1891 and incorporated in 1893, and has had a remarkably rapid growth in population and in the development of commercial and manufacturing interests. This has been due to its natural advantages as the centre of a productive lumbering, agricultural, and mining region. The city carries on extensive trade in lumber, shingles, paper, flour, and bullion, and there are large saw and shingle mills, pulp and paper mills, shipyards, iron-works, smelting and refining works, and many other industrial plants. Everett has a public library, and United States customs and assayer's offices. The government is administered under the State laws for cities of the third class, which provide for a Mayor, annually elected, and a city council. Population, in 1900, 7838.

EVERETT, ALEXANDER HILL (1792-1847). An American diplomatist and political writer. He was born in Boston, Mass., the son of the Rev. Oliver Everett, and brother of the orator Edward Everett. He graduated with highest honors at Harvard in 1806, was admitted to the bar, appointed United States *chargé d'affaires* at The Hague in 1818, and Minister at Madrid in 1825. Upon his return in 1829 he became proprietor and editor of the *North American Review*, and was elected to the Massachusetts Legislature. In 1840 he was sent by the Government to Cuba as confidential agent, and appointed in 1845 to a diplomatic post at Peking, a post which he held at his death. His literary activity began early. He made frequent contributions to *The Monthly Anthology* (1803-11). His first important book, *Europe, or a General Survey of the Political Situation of the Principal Powers, with Conjectures on Their Future Prospects* (1822), was translated into German, French, and Spanish. A similar work on *America* appeared in 1827, having been preceded by *New Ideas on Population* (1822). Other books were: *Critical and Miscellaneous Essays* (1845-47), and *Lives* of Joseph Warren and Patrick Henry in Sparks's *American Biography*. Frequent contributions, literary and political, to the *North American Review*, and economic essays in the *Boston Quarterly*, attest the unremitting labors of a busy life. He shared something of his brother's oratorical power, the more noteworthy of his published orations being "The French Revolution," "The Battle of New Orleans," and "The Battle of Bunker Hill."

EVERETT, CHARLES CARROLL (1829-1900). An American clergyman and educator, born at Brunswick, Cumberland County, Maine. He graduated at Bowdoin College in 1850, and took a supplementary course in Germany. After teaching languages at Bowdoin College he graduated at Harvard Divinity School (1859), and during the following ten years was pastor of the Independent Congregational Church (Unitarian) at Bangor, Me. He became Bussey professor of theology in Harvard University in 1869, and dean of Harvard Divinity School in 1878. His principal publications are: *The Science of Thought* (1869; revised 1890); *Fichte's Science of Knowledge* (1884); *Poetry, Comedy, and Duty* (1888); *Ethics for Young People* (1892); *The Gospel of Paul* (1893).

EVERETT, EDWARD (1794-1865). An American statesman, orator, and scholar. He was born at Dorchester, Mass., April 11, 1794; was at one time a pupil in a Boston school of which Daniel Webster, in the absence of his brother Ezekiel, was the teacher; graduated at Harvard in 1811; and in 1813 became the pastor of the Brattle Street Church (Unitarian) in Boston. As a preacher his career was brilliant though brief. He resigned his pastorate early in 1815, when not quite twenty-one years of age, to accept the Eliot professorship of Greek literature at Harvard. To fit himself more completely for this position he went to Europe, studied for two years in the University of Göttingen, where he received the degree of Ph.D., and then traveled extensively in England and on the Continent. Upon his return in 1819, he entered upon the duties of his professorship, delivering at the outset a course of lectures on ancient Greece, which he afterwards repeated in Boston. From 1820 to 1824 he was also the editor of the *North American Review*, to which he contributed a great number of articles. In 1824 he was elected to Congress from the Cambridge district, and was subsequently elected four successive times. During the whole ten years he was a member of the Committee on Foreign Relations, and in the Twentieth Congress was its chairman. In 1836 he became Governor of Massachusetts, which office he held by annual reëlection until 1840, having been defeated for an additional term, in the election of 1839, by a single vote. From 1841 to 1845 he was Minister Plenipotentiary of the United States to Great Britain. Returning in 1846, he reluctantly accepted the presidency of Harvard University, which position, however, he resigned in 1849. He then established himself in Boston with the purpose of entering upon literary tasks long postponed. He was summoned to fill the place of Secretary of State in the Cabinet of President Fillmore, made vacant by Mr. Webster's death (1852). He held this position only four months, retiring at the close of President Fillmore's administration. Before leaving the Department of State he was elected to the United States Senate. Everett represented the conservative Whigs, and was looked upon as Webster's political executor, insisting upon the inviolability of the Constitution and recognizing the presence and possible continuance of slavery. His health failing, he resigned his seat in the Senate in May, 1854, and retired to private life. In 1860 he was nominated for Vice-President of the United States by the Constitutional Union Party (q.v.). The ticket received 590,631 votes out of a total of 4,680,193, and 39 electoral votes, those of Kentucky, Virginia, and Tennessee, out of 303. When the Civil War broke out in 1861 he took his stand promptly with those who were determined to maintain the Union at every hazard. In the great crisis of 1864, when Lincoln was reëlected, Everett's name headed the list of Presidential electors of Massachusetts, and the casting of his vote for Lincoln was the last act in his political career. On January 9, 1865, he spoke in Faneuil Hall in behalf of the needy and suffering citizens of Savannah, and on the following Sunday, the 15th, he died. His orations and speeches have been published in four volumes (Boston, 1850-92), but there is no adequate biography. Considerable biographical material, however, is contained in *A Memorial of Edward Everett from the City of Boston* (Boston, 1865); and in Dana, *An Address upon the Life and Services of Edward Everett* (Cambridge, 1865).

EVERETT, William (1839—). An American educator and author, the son of Edward Everett. He was born at Watertown, Mass., graduated at Harvard in 1859, and at Trinity College, Cambridge, England, in 1863; was then assistant professor of Latin in Harvard from 1863 to 1881, and afterwards became master of the Adams Academy at Quincy, Mass. He has figured actively in politics as a civil service and tariff reformer in the Democratic Party. In 1897 he was licensed to preach in the Unitarian Church. He published *On the Cam* (1855), lectures giving his experience at Cambridge; *Changing Base* (1868); *Hesione, or Europe Unchanged*, a poem (1869), and *Double Play* (1870).

EV'ERGLADES. A great marsh, about 140 miles long and 50 miles wide, covering the larger part of the south end of Florida (Map: Florida, D 4). It is not a swamp in the commonly accepted sense of that term, for the water is clear and wholesome, and has a slow current. The region is gradually being drained by the processes of nature. The Everglades consist of a vast number of small, low islands separated by channels, in which the water is generally shallow (rarely exceeding ten feet in depth), and is concealed by tall grass. Fish abound. The islands are covered with dense masses of pine and palmetto, together with tropical shrubs and vines. The country is almost entirely wild, and is rich in small game. During the Seminole War in 1835 the Indians ambushed and destroyed in the Everglades a body of United States troops under Major Dade, and were not driven out until after a struggle which cost the Government 1500 men and $10,000,000.

EV'ERGREEN. A town and the county-seat of Conecuh County, Ala., 99 miles northeast of Mobile; on the Louisville and Nashville Railroad (Map: Alabama, C 4). It is a winter resort, noted for its mineral springs, and has the Second Congressional District Agricultural School and Experiment Station, and the State Baptist Orphanage. The town is interested chiefly in agriculture and market gardening. Population, in 1900, 1277.

EVERGREEN. A plant which retains its foliage organs throughout the year. Evergreens contrast naturally with deciduous trees. These latter shed their leaves periodically, whereas the leaves of evergreens are more persistent and are not shed periodically. The term evergreen is used particularly in the case of trees, and the forests of the world are subdivided into various ecological groups, the basis for which is the nature of the foliage, whether deciduous or evergreen. Evergreen forests are again subdivided into the northern or conifer types, the sclerophyll or winter-rain type, and the tropical type in regions whose atmosphere is always moist. See Forest; Leaf.

EVERGREEN ISLE. A popular designation for Ireland.

EV'ERHART, Benjamin Matlack (1818—). An American author and botanist. He was born near Westchester, Chester County, Pa., and spent the first forty years of his life in mercantile pursuits. In 1860 he retired from business and devoted himself to botanical research and to gathering and arranging a great collection of fungi, comprising thousands of specimens. He discovered nearly three hundred new species of lichens, mosses, and liverworts, and became known as one of the greatest authorities in this branch of botanical science. In association with J. B. Ellis he founded the *Journal of Mycology*, the publication of which was subsequently taken up by the United States Government. Nine plants have been named in his honor. His principal publications are *Ellis's North American Fungi*, and *The North American Pyrenomycetes*, with original illustrations by W. F. Anderson (1892), a valuable monograph.

EVERLASTING FLOWER. A name given to various flowers, among which are certain species of amaranth (q.v.), and of helichrysum. See Immortelle. See Plate of Goldenrod.

EVERLASTING GOSPEL. See Joachim of Floris.

EVERLASTING PEA. See Lathyrus.

EV'ERSLEY, Charles Shaw Lefevre, Viscount (1794-1888). An English politician. He was born in Yorkshire; was educated at Trinity College, Cambridge; was called to the bar in 1819, and entered Parliament in 1830, where he became a steady supporter of the Whig Government. He was many times chosen Speaker of the House of Commons, and won distinction by his reforms in procedure.

EVERY MAN IN HIS HUMOUR. Jonson's first extant comedy, produced at the Globe in 1598, Shakespeare himself taking a part, and printed in 1601. It proved the most vital of Jonson's plays. Garrick, after revising the piece, played the part of Kitely with great success.

EVERY MAN OUT OF HIS HUMOUR. "A Comicall Satyre," by Ben Jonson, produced in 1599 and published in 1600. The characters Buffone and Clove are both caricatures of the playwright Marston, with whom Jonson had had a quarrel.

EVESHAM, ēvz'am, originally **EOVESHAM.** A municipal borough and market-town in Worcestershire, England, on the right bank of the navigable Avon, 15 miles southeast of Worcester (Map: England, E 4). It lies in a beautiful and fertile vale, and has for many years been noted for market gardening. It is well built, and lighted by gas. The gas-works and water-supply are owned by the municipality. It has a grammar school founded in 1546 and a free public school. It has manufactures of gloves and hosiery. An abbey was founded here about 700, of which nothing remains but a fine tower and gateway. It was the scene of Simon de Montfort's defeat by the royal troops August 4, 1265, terminating the Barons' War. Population, in 1901, 7100. Consult New, *A day at Evesham* (Evesham, 1881).

EVICTION (Lat. *evictio*, from *evictus*, p.p. of *evincere*, from *ex*, out + *vincere*, to conquer). The expulsion or removal of a tenant from the possession of a real property either by his landlord or by another acting under a paramount title. The term was formerly confined to dispossession by legal process, but it is now applied to every form of dispossession under a title superior to that of the person evicted. Disturbance of possession by a stranger, i.e. by one having no title to the lands in question, is not an eviction, but a trespass, punishable by a tort action. An eviction, on the other hand, whether rightful or wrongful, is not a trespass, and is not punishable as for a wrong. Its effect is confined to the dissolution or modification of the relation of landlord and tenant between the lessor and lessee.

An eviction by a landlord of a tenant at will or at sufferance, or of a tenant who has forfeited his estate by the commission of waste, or by the breach of any condition on which the lease depended, is the normal and proper mode of terminating the relation between the parties. The eviction operates *ipso facto* to determine the tenancy. A similar act of dispossession of one wrongfully in possession of property by the rightful owner is not an eviction, but is more properly described as a reëntry. (See ENTRY, RIGHT OF.) When, however, the person so in possession claims under a lease from a third person, the process may, from his standpoint and in relation to his landlord, be an eviction. Its effect is to terminate the lease and to set the tenant free from his obligations to his landlord. It is an eviction by paramount title. If the eviction in this case be only partial, however, i.e. from part and not the whole of the premises, the tenant may still be liable to his landlord for so much of the premises as remains in his possession.

On the other hand, if the tenant be unlawfully evicted by his landlord, it is immaterial whether the eviction be total or partial. A lease of land carries with it an implied covenant for the quiet enjoyment of the demised premises (i.e. a covenant that the tenant shall not be disturbed by an unlawful eviction by his landlord or by paramount title), and rests upon the condition that this covenant shall be observed. Any willful eviction from any part of the premises by the landlord's act is a breach of this condition and entitles the tenant to avoid the lease and refuse to pay rent, even though his possession of part of the premises is undisturbed. In this case, however, if the tenant remain in possession of a part of the premises, the rent is only suspended, and he may become liable under the lease again, if he is restored to the part from which he has been evicted.

Strictly speaking, eviction involves the notion of an actual forcible removal or exclusion from the premises held by a tenant, and at common law nothing less than this would protect him against the claims of his landlord under the lease. This rigid rule has been modified in two particulars in certain of the United States. In Massachusetts and a few other States it has been held that when the premises are claimed by paramount title the tenant is not bound to await a forcible removal, but may yield to a demand for possession made on the premises. In New York it has been held that the landlord may effect an unlawful eviction, and thus release his tenant from his obligations under the lease, without any physical interference, by the process known as a 'constructive eviction.' This consists of a nuisance willfully maintained by the landlord, either upon or in close proximity to the tenant's premises, of such a character as to deprive the tenant of his rightful enjoyment of them and force him to abandon them. This doctrine has also been applied to a variety of acts or omissions by a landlord which do not come under the ordinary description of a nuisance, such as the refusal of the proprietor of an apartment house to furnish the heat or the elevator service stipulated in the lease. The courts have, upon the contrary, refused to carry the principle to the extent of permitting a tenant to claim a constructive eviction and abandon the premises because of the landlord's failure to make promised repairs, even though the premises are rendered untenantable by such failure.

The rights accruing to a tenant under an eviction may usually be supplemented by a right of action against the landlord for damages, and the tenant may recover under the covenant of quiet enjoyment from the lessor the damages sustained by him as the result of the breach. See LANDLORD AND TENANT, and the authorities there cited.

EVIDENCE. The means by which the truth or untruth of any relevant fact is established in the trial of an action at law. What is and what is not legal evidence is determined primarily by the pleadings in the action. The early common-law system of pleading was so devised as to narrow down all matters of dispute between the plaintiff and defendant to a single issue of law or fact. If the issue was one of law, a question was raised for the court only; but if the issue was one of fact, a question was raised for determination by a common-law jury, after a trial in which evidence was introduced on the one side to prove the alleged fact, and on the other to disprove it. The whole system presupposed, on the part of the jury, inability to consider more than one issue of fact at a time, and in the consideration of that one issue, to some extent, lack of capacity to give to different classes of logically relevant evidence their proper weight. It is to the historical development of the jury system, therefore, that many rules of the law of evidence may be attributed, which now seem to be unwarranted in logic and unsuited to the times.

Modern systems of pleading permit the raising of numerous issues of fact, and have thus imposed on the jury duties requiring a higher standard of intelligence than under the ancient system. The rules of evidence, however, partly because they have been found to be practically sufficient, and partly because of the necessity of fixed and definite rules in the branch of the law, have not undergone a corresponding change, and many matters of evidence logically relevant and of considerable probative force are still not legally admissible evidence because of their supposed tendency to 'confuse and mislead the jury.'

I. The rule of first importance in the law of evidence is that it must be relevant in order to be legally admissible. Relevancy depends directly or indirectly on the issue raised by the pleadings. Thus, evidence of a fact may be relevant because it tends directly or indirectly to prove or disprove the fact in issue that is affirmed by one side and denied by the other; or the evidence may be relevant because it tends to prove or disprove some matter of evidence already introduced by the other side for the purpose of proving or disproving the issue raised by the pleadings. But, as has been pointed out, all logically relevant evidence is not legal evidence. Thus evidence which is logically relevant may not be legally admissible because: (a) Its relevancy is slight or remote. Thus evidence that the defendant was insolvent at a certain time is not admissible to prove that he borrowed money of the plaintiff at that time. (b) The evidence is of collateral transactions, or (as is sometimes said) *res inter alios acta*. Thus, in an action to recover damages for negligence it is not permissible to show that the defendant was negligent toward others than the plaintiff, or on trial of a defendant for stealing, that he stole from others. The general rule is, however, subject to many limitations and modifications more or less arbitrary. Thus it is permissible to show, in an action of tort, brought to recover for injuries caused by a defective appliance belonging to the defendant, that others were injured by it in a similar manner, and, generally, value of land may be shown by proving the selling price of other land similarly situated. A full consideration of these limitations and modifications is not within the scope of this article. So far, however, as they may be said to rest on any settled principle, their extent now depends upon whether there is other more available and satisfactory evidence, and to some extent upon the discretion of the trial judge. The character of a party to a civil action is not regarded as relevant, and is, therefore, not the subject of evidence, unless the character is directly put in issue by the pleadings, as in an action for libel. In a criminal trial, however, the defendant may, if he so elects, introduce evidence of his character, which evidence the prosecution may then rebut.

II. Hearsay. What others than the witness have said before the trial is not generally admissible in evidence because not sworn to, and because not subject to cross-examination. This rule, known as the 'hearsay-evidence rule,' is subject to several important exceptions: (a) *Admissions and confessions.*—Statements, either oral or written, made at any time by a party to an action or by his predecessor in interest, may be introduced in evidence against him, but not by him or in his favor. The rule is based upon the inherent probable truth of statements which are prejudicial to the interests of the party making them. Under the rule as to predecessor in interest, the admissions of a deceased person are admissible in evidence in actions against his executor, or admissions as to the title of real estate made by its then owner are admissible in an action founded upon the title brought against his subsequent grantor. Admissions made by an agent within the scope of his authority are admissible in evidence against the principal. Confessions are strictly admissions made by one charged with a crime, and, because of the necessity of safeguarding one charged with a crime, are not admissible when obtained by means of threats or promises of favor. This rule has been extended by statute in many of the States.

(b) *Reported Testimony in a Prior Trial.*—In general the testimony of a witness in an earlier trial between the same parties and relating to the same issues, or between parties identical in interest with the parties at the present trial, may be introduced in evidence if the witness is dead, insane, unable to attend the trial, out of the jurisdiction, or kept from appearing at the trial by an opposing party. The testimony in the earlier trial must have been sworn to and subject to cross-examination, thus obviating the usual objection to hearsay evidence.

(c) *Dying Declaration.*—Declarations made by a person *in extremis* are admitted in evidence upon the trial of one charged with the crime of homicide, either in favor of the prosecution or the prisoner. See Declaration, Dying.

(d) *Admissions Against Interest.*—These should not be confused with admissions (see above). They are admissions in any form against financial or proprietary interest of the person making them and made by one who, at the time of trial, is dead. Unlike admissions, they need not be made by one having some connection with the party to the action. They must, of course, in themselves be relevant to matters in issue at the trial. Thus an indorsement written on a note by the holder that a part of the note is paid, or a book entry that a bill has been paid, or a statement that the declarant is a tenant (rather than the owner), are all admissions against financial or proprietary interest, and are admissible in evidence upon proper authentication if relevant, and if the declarant be dead.

(e) *Book Entries.*—Book entries or reports made pursuant to a legal duty or in the usual course of business by one since deceased having personal knowledge of the matter so entered or reported are admissible in evidence to prove the truth of matters contained in the entry. Thus the book entries of clerks or written reports of officers are admissible in evidence under this head, but not the entries in a diary, because not made pursuant to a duty. Closely related to the rule as to entries made in the course of business is the so-called shop-book rule. This rule varies considerably in different jurisdictions, but the effect in all is substantially to allow a party to an action, although present at the trial in person, to prove an account by introducing in evidence his book of account. He is usually required to make preliminary proof that he is engaged in the business in which the charges in the book are made, and that he has made correct entries. A witness may always be allowed to refresh his memory by referring to memoranda or book entries; in that case the memoranda or book entries are, however, not directly in evidence, and the jury may rely only upon the witness's oral testimony.

(f) *Res Gestæ.*—Any statement made at the time of the happening of an event by one who was then present may be introduced when the event itself is in issue or relevant. Such evidence is admitted on the theory that the statement is incidental to the event itself, and to some extent characterizes or explains it. Thus on the murder trial of a defendant it is proper to prove a statement made at the time of the homicide by any person present, which tended to show that the defendant committed the homicide or that the act was intentional or malicious. There are some other exceptions to the hearsay-evidence rule, but these are of infrequent occurrence and of comparative unimportance, and do not admit of discussion here.

III. Real Evidence, Writings. Legal evidence is not limited to the sworn testimony of witnesses. Specific objects, when properly identified by oral testimony, may often be introduced in evidence when their very existence or their character or appearance tends to prove or disprove an alleged fact. Thus models, parts of machinery, weapons, clothing, etc., may be introduced in evidence. Such evidence cannot of course be submitted to an appellate court as a part of the record of the trial, and for that reason the extent to which such evidence may be received may be limited within the discretion of the court, and in some jurisdictions practically no such evidence is admitted. Writings or documents may generally be introduced directly in evidence for the purpose of proving the truth of statements contained in them. At common law documents purporting to be more than thirty years old required no particular authentication, or, as was said, such documents proved themselves. The execution of other documents must, however, be proved by the sworn testimony of a witness to the execution, or, if he be dead, by proof of the handwriting of the person who executed the document. The so-called best-evidence rule applies to documentary evidence. Briefly stated, it is that the best evidence of the contents of a document is the document itself, and that no other evidence of the contents of a written instrument is admissible. This rule is subject to many exceptions, real or apparent. Thus: (a) Where the original document is in duplicate form any one of the duplicates may be introduced in evidence as an original. (b) Secondary evidence (i.e. a copy or oral testimony) of a written notice is admissible. (c) Matters of public record may be proven by secondary evidence, in most jurisdictions by a certified copy of the record. (d) Secondary evidence may also be introduced to prove an instrument which has been lost or destroyed, or whenever the other party to an action, having the document in his possession, fails to produce it at the trial for the purpose of preventing its being introduced in evidence on due notice. One who has willfully destroyed a document will not, however, be allowed to give evidence of its contents. When proof of a document is offered but for the purpose of proving the truth or untruth of any statement contained in it, it is real evidence, as distinguished from a writing; and the best-evidence rule should and probably does not apply. The common-law rule as to proof of documents has been much modified by statute. In most jurisdictions all documents attested before a notary or corresponding officer are *prima facie* admissible in evidence if relevant.

IV. The Parol-Evidence Rule. This is properly a rule of substantive law which is, in effect, that the terms of a contract or other legal instrument should be deemed to be embodied wholly in the written instrument executed by the parties thereto, or, stated in terms of evidence, the rule is that parol or oral evidence shall not be introduced for the purpose of varying the terms of a written instrument. The rule, though necessarily subject to many exceptions, is founded upon the just notion that when parties have deliberately embodied their agreement or transactions in writing, they should not thereafter be allowed to dispute its terms. The following are the most important cases in which to vary the express terms of a written instrument testimony may be given:

(a) Where the parties did not intend to reduce all the terms of the agreement to writing.

(b) When the writing or agreement is varied by a subsequent parol agreement.

(c) When the evidence is introduced to show that the written instrument has never taken effect because of the non-occurrence of some agreed condition precedent.

(d) When a term of the instrument is ambiguous and parol evidence is necessary to explain the meaning, and upon analogous grounds where the term of a written instrument has a technical or local meaning requiring oral explanation.

(e) When the proof of a custom which is in law a part of a contract or other document varies the effect or meaning of the written language.

(f) When in equity an action is brought to reform or rescind a written instrument, or construe a conveyance as a mortgage.

V. Opinion Evidence. In general witnesses are allowed to testify only as to facts, and not as to their inferences or opinions based upon facts within their knowledge. To permit the witness to indulge in opinion testimony would be a usurpation of the function of the jury, whose duty it is to draw inferences of fact and to form an opinion, where an opinion is necessary to the verdict. Thus the witness, when the facts of a conversation are in issue, must testify as to the terms of the conversation and not his conclusions as to its meaning. There are, however, three important exceptions to the rule that opinion evidence is inadmissible. They are: (a) Matters of common experience; matters of common knowledge to a certain extent the result of inference. Thus, to testify that a certain day was cold, or that a knife was sharp, involves the operation of the witness's mind in drawing a conclusion; but since these are matters of common experience about which the conclusions of the witness are as trustworthy as those of a jury, such testimony is legally admissible as evidence. (b) Matters not of common experience, but about which the opinion of the witness is under the circumstances more trustworthy than any which could be formed by the jury. Thus, a witness may be so situated with reference to an event or combination of circumstances as to be able to draw a more accurate conclusion from them than the jury, which should rely wholly upon verbal testimony about the occurrence. Thus, the witness may be allowed to give his opinion of the distance between an approaching street-car and a pedestrian before warning of the approach was given; or, under certain circumstances, he may be allowed to give his opinion of the rate of speed at which the car was moving. His presence at the time of the event enables him to form a more accurate opinion than the jury, which can only rely upon a necessarily imperfect description of the occurrence. (c) Expert testimony. A witness may be allowed to testify as to his opinion because, by reason of experience or special study and investigation, he is better qualified to form an opinion than the jury. Thus, physicians, engineers, handwriting experts, etc., are allowed to give opinion evidence in order to aid the jury in reaching a correct conclusion. They are not allowed, however, to express any opinion as to the truth or untruth of other evidence submitted to the jury, that being a matter of which the jury is qualified to judge. The testimony of experts, so far as it is opinion evidence, is based upon the evidence already before the jury, assuming it or parts of it to be true. For that reason questions asked of expert witnesses are usually required to be hypothetical in form.

VI. WITNESSES' COMPETENCY. A witness is not competent to testify until he has taken oath to testify truly. At common law an atheist or other unbeliever in the Christian religion was not a competent witness, because it was believed that he would not feel constrained by his oath to testify truly. At the present time a witness is generally allowed to testify on his oath or affirmation, no particular religious belief being requisite. A child is a competent witness if old enough to understand the nature and obligation of an oath, and an insane person may testify upon a matter concerning which his understanding is not affected by his insanity. At common law one convicted of a felony within the jurisdiction was incompetent as a witness unless pardoned. In most jurisdictions such a conviction now affects the credibility only, and not the competency of the witness. At common law a party to an action was not a competent witness in his own behalf, nor was one a competent witness if directly interested in the controversy. This disability has been generally removed by statute. Nor could either the husband or wife testify for or against the other at common law. This disability has been removed to some extent by statute in most jurisdictions, but not generally so as to permit testimony as to confidential communications between husband and wife.

It was the policy of the common law to protect the witness from being compelled to incriminate himself. He is therefore privileged from giving any testimony which tends to incriminate him or to subject him to a penalty or forfeiture. If the witness does not claim his privilege, his testimony is competent and subject to the usual rules of the law of evidence. Having once fairly waived his privilege, he must testify fully. Thus a defendant in a criminal trial is privileged from being compelled to testify; but having offered to testify in his own behalf, he must answer proper questions directed to him on cross-examination. At common law, also, an attorney and client were privileged from testifying as to any confidential communication between them. By statute this privilege has in most jurisdictions been extended to persons standing in other confidential relationships, e.g. physician and patient, clergyman or priest and layman, and in some jurisdictions, notably New York, attorneys, physicians, and clergymen are not competent to testify as to confidential communications received by them in their professional capacity. Upon the similar ground of public policy, a party is privileged from testifying as to his efforts or willingness to compromise the matter in controversy, and it is probable that the President of the United States and the Governors of States are privileged from appearing as witnesses under any circumstances.

VII. EXAMINATION OF WITNESSES. Witnesses may be classified as favorable or opposing. A favorable witness is one called by a party to testify in support of his contention in the controversy, and an opposing witness is one called by the other party to the controversy to testify in his behalf. The favorable witness on one side is therefore the opposing witness of the other. As a general rule one is not allowed to ask his own (or favorable) witness leading questions, that is, questions which by their form indicate the answer desired. The extent to which leading questions may be asked, however, rests in the discretion of the trial judge, and should the witness prove hostile leading questions may be asked. One may not impeach the credibility of his own witness; that is, he is not allowed to introduce testimony to show generally that the witness is not worthy of belief. He may, however, contradict the testimony of the witness by other witnesses for the purpose of showing the truth as to a fact about which the first witness has testified. At the close of the direct examination, or the examination of a favorable witness, counsel for the other side may cross-examine, that is, may examine him as an opposing witness. On cross-examinations it is permissible to ask leading questions. The cross-examiner may also attack the credibility of the witness, and for that purpose may ask questions not otherwise relevant. The witness, however, may refuse to answer questions of this class which tend to incriminate or degrade him. The credibility of an opposing witness may also be attacked by introducing testimony to show that he is generally unworthy of belief.

THE BURDEN OF PROOF. From the nature of pleading and the trial of an action at law it follows that upon one party or the other to the controversy rests the burden of introducing some evidence in order to establish his contention. The burden of proof is said to rest upon the party against whom a judgment must be given if no evidence be introduced in his favor. The same doctrine is stated in slightly different terms by saying that the burden of proving a fact rests upon him who asserts the existence of the fact in his pleading, and not on him who denies it. The party on whom the burden rests may, by the introduction of some evidence, make out a *prima facie* case, and then arises the legal necessity for the other party to introduce evidence enough to destroy the *prima facie* case of his opponent. Thus at various stages of the trial the burden of introducing evidence may shift from one side to the other. It is evident, therefore, that the common expression that the burden of proof shifts during the progress of a trial is not exact, unless the word proof be taken in the sense of attempt to establish the truth of a fact, and not in its usual legal sense as such evidence as satisfies the mind. In civil trials the party on whom rests the burden of proof must sustain his case by the preponderance of evidence. In criminal trials the burden of proof rests upon the prosecution, which is required to prove its case beyond a reasonable doubt. In sustaining the burden of proof the party upon whom the burden rests is aided in making proof by the doctrines of judicial notice, and of presumption. It is unnecessary to prove facts of which the court will take judicial notice. In general these are facts of such common and universal knowledge that it would be idle to prove them by affirmative testimony. Thus (to cite a few of the innumerable cases) it is unnecessary to prove the calendar, the multiplication table, that water will freeze, or that ice will melt. The party sustaining the burden of proof is also aided in making proof by proving one fact or set of facts from which certain consequences are presumed to flow. (See PRESUMPTION.) All so-called circumstantial evidence is evidence intended for the purpose of creating a presumption of some other fact sought to be proven.

In general courts of equity follow the rules of evidence as adopted by the common-law courts. The important exceptions have been noticed above.

In the United States the Federal courts in civil cases follow rules of evidence applied by the local State courts, unless a different rule is required by Federal statute. In criminal trials they follow the common law as interpreted by the Federal courts, and as modified by Federal statutes. In the several States the common-law rules of evidence are generally followed with comparatively few statutory modifications, the more important of which have been noted. Consult: Greenleaf, *Treatise on the Law of Evidence* (16th ed., Boston, 1899); Thayer, *Preliminary Treatise on Evidence at Common Law* (Boston, 1898); id., *Cases on Evidence* (Boston, 1900); Stephen, *Digest of the Law of Evidence* (May, editor, Boston, 1877); Abbott, *Select Cases on Evidence* (New York, 1895); id., *Trial Evidence* (New York, 1900); Powell, *Principles and Practice of the Law of Evidence* (7th ed., London, 1899); Best, *Principles of Evidence* (9th ed., London, 1902).

EVIDENCES OF CHRISTIANITY. The title given to apologetics, or the defense of Christianity against the objections of its opponents. The occasion for such defense arises from the fact that Christianity, while it is primarily a life in the soul of man, is also a system of ideas, which are the means by which its distinctive life is produced and maintained. It thus meets the systems of thought already existing in the world, and is found to differ essentially from them. Hence, first, the satisfaction of the rational faculty in the Christian himself calls for an adjustment of Christian doctrines to the principles and results of human thinking, the result of which is systematic theology; and, second, the practical work of the extension of Christianity calls for a defense of its doctrine against the hostile criticism inevitably arising, the result of which is the science of evidences. From the time of Justin Martyr, the first Christian philosopher, to the present, Christianity has continually given rise to apologetic treatises.

(1) The defense of Christianity must depend upon the conception of Christianity which the apologist entertains. Evidences thus begin with definition. Christianity is that religion which saves man from sin and the consequences of sin by the intervention of God in his behalf in sending His Son to assume human nature, in which He perfectly revealed the will of God and laid the foundation of salvation by the sacrifice of Himself. As thus defined, Christianity is a supernatural religion, that is, a religion employing agencies above nature and man. Its chief event, the Incarnation, is a miracle. It surpasses, and in a sense traverses, nature. It is the personal contact of the divine principle with humanity, as distinguished from the impersonal contact which the same principle has with man in nature.

(2) Christian evidences begin, therefore, with this fundamental fact of personal contact with the divine. This contact takes place at the central point of personality in man, the will, which it originally and continually moves to new moral choices. It is thus a matter of consciousness, of experience, and the first series of Christian evidences gather about the experiences of the soul which are produced by Christianity and are characteristic of the same. The argument is direct from the revolutionary choice by which the Christian life is ushered in, to its cause—something without the Christian, a person, because adapting motives to his condition; holy, because leading to holiness; and immeasurably great, because governing him and doing all that is involved in such a government—who is, therefore, God. The evidence of the great feature of Christianity as a personal contact of God with man is, therefore, the fact that the Christian has experience of such a contact in the very act by which he becomes a Christian. This is evidence of the very first degree of certainty to him, and affording the most perfect satisfaction, since it is a matter of immediate consciousness. To every non-believer it sustains the character of testimony. It is unassailable by him in respect to its possibility if he accepts the existence of a personal God. He cannot reasonably deny its actuality, because this would be to deny what generations of men, of the most diverse character and under the most diverse conditions, by which both collusion and delusion are equally excluded, assert. He can only reasonably object that he himself knows nothing of such a contact. Christian experience, however, goes still further. As the Christian has experience of the personal contact of God with the world for its salvation in the instance of that contact which is furnished by his own personal participation in the work of Christianity for man, so he experiences the operation in himself of the various forms in which this contact develops in the complete work of Christianity for the world. He comes into contact with Christ, and he thus knows something of the nature of the Saviour by personal experience. Thus the proof of the Incarnation, the chief miracle of Christianity, gains an element of personal evidence. And as his experience enlarges, the witness of experience to truth enlarges also. In the final result he may be said to have personal, and, to him, irrefutable, evidence upon every one of the main points of Christianity in the experiences of his own soul.

(3) But, as already suggested, this evidence is not directly accessible to the unbeliever, and it is to him that the arguments of evidences are addressed. He may possibly feel himself unable or unwilling to dispute the testimony of Christians; but he cannot attain any personal certainty for himself till other arguments, which do enter into the range of his own thought, are added. Hence the argument of this discipline turns next to the proofs of Christianity from its objective nature. Christianity is incorporated in the person of its founder, and the nature of Christianity is illustrated by His character. The

character of Jesus, as depicted in the four Gospels of the Church, is one of unrivaled excellence, of genuine and unqualified perfection. As a manly character it is surpassingly great, combining strength and gentleness in perfect harmony. It has universally obtained the consent of men to its ideal excellence. But its chief peculiarity removes it from the category of the natural, for it is without the stain of sin and possessed of positive holiness in the supreme degree. There is no self-reproach on the part of Christ, no successful accusation against Him by His enemies. On the contrary, He professes sinlessness, and no man refutes Him. Such a character is miraculous, if genuine; and it is genuine, because the disciples could never have invented it. It is not only too lofty for them to invent, but it is of a unique kind, setting forth by example a new kind of excellence which men were not prepared for, the excellence, that is, of perfect gentleness and self-sacrificing love. To produce that character Christianity must be divine.

Another branch of this argument is gained from the doctrines of Christianity. The doctrine of God, as a personal cause, source, and sustainer of all things, whose character is love, is the confessed acme of human thought, but historically it has not come from human thinking, but from the Jewish-Christian religion. That religion claims to have it from God Himself by revelation; and no other satisfactory source has appeared or shows any likelihood of appearing. The Christian system of ethics, so contradictory of other systems at its fundamental point, that the root of ethical conduct is love, is now confessedly the highest which the mind of man has elaborated. And all the rest of the great doctrines of Christianity commend themselves as true. Christianity is the only system which fairly faces the facts. It is the only system which recognizes and fully defines sin. It is equally unique in giving full recognition to human personality as it is in recognizing the divine personality. These facts exhibit the truth of Christianity; and its truth is an evidence of its divinity.

(4) Corroborative of these arguments is another argument derived from the successes and the extension of Christianity. Abraham was a solitary wanderer, but Israel became a great nation. It survived slavery and exodus, wars and captivity. Its religion gained steadily in control of the people and in purity and exaltation in its view of truth. Christianity was rejected by the nation from which it sprang, but it found new nations in which to become the controlling power. It fell into corruptions, but it recovered from them. It gradually extended its system of truth. It engaged in missionary enterprises from age to age, and is to-day advancing to the conversion of all the remaining heathen nations with more system and success than it ever has displayed. It is the chief influential power in the chief nations of the earth to-day. Its practical power does not appear to have been much diminished by the special antagonism which has been called forth against it by the new thought of our day. This success in extending and maintaining itself affords a strong presumption that its claims to divine origin are correct.

(5) When we come to the miracles which are recorded in the Bible, we come to an evidence in behalf of Christianity which itself needs first a thorough-going establishment, since it is the most controverted element of Christianity in this age. The progress of natural science, with its emphasis upon the universal reign of law in the world, has produced the conviction, in large circles of just that unbelieving world to which Christian apologetics are addressed, that a miracle is an impossibility. The miracles of Christianity are, therefore, now an objection to Christianity, and must first be defended themselves before they can afford any evidence in behalf of the system. The defense of miracles starts out with the fact of the personality of God. He has made the world and given it the laws which are operative within it. He is superior to them. If He wills, He can act in ways above them. His personality gives the opportunity for this, and establishes the possibility of occurrences which the laws of nature, left to themselves, could never produce. The next stage of the argument is the exhibition of a sufficient reason for the occurrence of miracles; and it finds this in the sin and ruin of man, and in the necessity of divine intervention for his salvation. The final stage is the appeal to the testimony that miracles actually did take place. This appeal is rendered the easier because Christianity has already established the character and mission of Jesus Christ. If He was what He professed to be, and what Christianity receives Him as being, God manifest in the flesh, then miracles are natural in a high sense, that is, it would be highly inexplicable if they did not occur. Could a being having the love for man that Jesus had pass through the suffering crowds in Capernaum's streets and not dispense gifts of healing on every side? To us, then, in this day, Christianity, taken as a whole, attests the biblical miracles. They did occur. And that they occurred comes in as a subordinate confirmation of Christianity, for we should expect them, since men needed to have the divine manifestly among them for their own comfort and conviction of the truth.

The main brunt of the argument, therefore, comes on the biblical testimony to the actuality of the miracles, and hence the character of the documents of primitive Christianity, that is, of the New Testament, becomes of the utmost importance; and here the opponents of Christianity have expended no small part of their strength. But it is certain that all four of our Gospels were well known throughout the Church by A.D. 175, for Irenæus, writing not long after that date, has become so used to thinking of them as four that he regards this number as a self-evident propriety, as there are four quarters of the earth, etc. The first three Gospels are very plainly traceable back through the series of post-New Testament writers to the decade A.D. 90-100, and are pronounced by the latest authorities as written between the years 65 and 93. The fourth Gospel is not so plainly traceable. Justin Martyr has an evident citation of a passage from it, and the *Teaching* has phrases which have the same ring as the Gospel. The period about the year 100 is 'saturated with Johannine thought.' Its contents must have come from the Apostle John in substance at least, though other hands may have had a share in bringing the document to its present form, and may have disarranged a little its true order. It is also substantially Apostolic. Equally certain is it that Paul wrote the four 'undisputed' Epistles, I. and II. Corinthians, Romans, and Galatians, even if not the others usually attributed to him. We have therefore in this group of writers the Apostolic testimony.

Interrogating that testimony as to miracles, apologetics usually expends its chief efforts in connection with the resurrection of Christ. This is the greatest objective miracle and the most important. If it stands, the rest will stand also. Was this miracle actual? The Apostolic testimony, as gained from the Gospels and the four great Pauline Epistles, is plain, unanimous, and clear. It is that Jesus Christ really died, and that He rose from the dead and appeared to the disciples—to enough of them, and on occasions enough, to exclude the possibility of subjective delusion or of insufficient opportunity to know the truth. Furthermore, it is evident that these Apostles did not expect His reappearance, but were overwhelmed with despair under the influence of precisely the thoughts which the Jews exulted in—that death had brought to an end the dream of a new kingdom to be set up by Jesus as the Christ. And their honesty is made manifest by their unfavorable account of themselves and of their leaders. No explanation which has been proposed to account for the early and triumphant belief that Jesus had risen, though He had not, has gained any considerable credence or been worthy of it. The natural effect of the testimony of the Apostles must be allowed to have its due course, that Jesus really did rise from the dead. This greatest of all miracles thus established, the credibility of all the rest follows.

(6) The argument from the fulfillment of biblical prophecies is also a branch of Christian evidences. Certain critics of the Old Testament have generally referred prophecy to a later date than the prophesied event, and hence made the argument from prophecy difficult, as in the case of the miracles. But it is indisputable, upon any sane criticism of the Old Testament, that the Jewish history as a whole is prophetic, that Israel looked forward to a coming Messiah, that there were sufficient indications in the ancient records of His nature to admit of His recognition and to show the divine plan in His coming. But this is the centre and determinative element of the argument from prophecy.

Consult: For the evidence of experience, Frank, *System of Christian Certainty* (Edinburgh, 1886); Stearns, *Evidence of Christian Experience* (New York, 1891); Foster, *Christian Life and Theology* (New York, 1901). Butler, *Analogy* (London, 1736), is one of the principal historic treatises. Paley, *Evidences* (London, 1795), is classic, though in part superseded. Hopkins, *Evidences* (Boston, 1864), marked a new era in the subject. Other works are: Fisher, *Grounds of Theistic and Christian Belief* (New York, 1883), and *Manual of Christian Evidences* (New York, 1888); Bruce, *Apologetics* (London, 1892). Several series of apologetic lectures of high value have been delivered by Luthardt of Leipzig.

EVIL (AS. *yfil*, Goth. *ubils*, OHG. *ubil*, Ger. *übel*, evil; probably connected with Goth. *ufar*, OHG. *ubar*, Ger. *über*, AS. *ofar*, Eng. *over*, Lat. *super*, Gk. ὑπέρ, *hyper*, Skt. *upari*, over). Evil may be generally defined as frustrated desire, or the cause or causes of frustrated desire. If a being had no wants, no desires, no aspirations, for that being nothing could be an evil. His own destruction would be a matter of absolute indifference, and all his experiences would be mere colorless events. It is often said that for science there is no evil in the universe. But this statement presupposes that all is law and order in the universe, and that this uniformity of law in nature is what man as an intellectual being desires. For a being that wishes to know, ignorance and all causes of ignorance are evil; and chaos would be an insuperable bar to knowledge, hence would be an evil. The law-abidingness of nature makes knowledge possible, hence is for an intelligent being good. But man has other desires than curiosity to know. And whatever thwarts any of these desires is so far evil. Evil is absence of food for the hungry, lack of water for the thirsty; rebuff from the beloved for the lover; disappointment for the ambitious; death for him who is filled with a lust for life. To the person, therefore, who inquires why there is evil in the world the answer given must be: "Because in the world there are beings possessed of desire, and not possessed of the means to satisfy desire." Usually the question has reference to *moral* evil. But as an evil, moral evil differs no whit from any other evil. It is an unsatisfied desire or its cause. When the evil is moral, the unsatisfied desire is for a moral order. (For a discussion of the question what morality and moral order are, see ETHICS.) What makes moral evil more serious than other evils is the fact that human interests are more intimately and more extensively concerned in the moral order than in anything else.

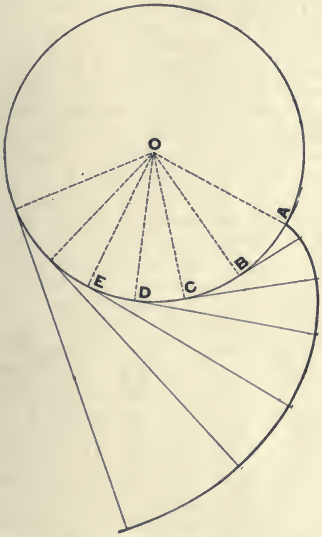
Many theological and philosophical answers have been given to the question as to the origin of evil. Thus the dualism of Zoroaster maintains that evil arises from the action of Ahriman in his ceaseless antagonism to Ormazd (see AVESTA, ZOROASTER, MANICHÆISM, GNOSTICISM). Traditional Christian theology traces human evil to the fall of Adam and Eve, which, according to the account in Genesis, was brought about by the agency of the serpent. In accordance with later Hebrew tradition, the serpent is regarded as representing Satan, the personal principle of evil in the universe. Satan differs from Ahriman in not being coördinate with the principle of good. This opens the question of the relation between Satan and God, which has furnished opportunity for many a theological controversy. Again, many philosophers and theologians give a rationalistic account of the origin of evil by saying that it is a metaphysical counterpart of good; that it is as impossible to conceive good without evil as it is to conceive an inside without an outside. Others again make evil a necessary result of finitude; whatever is limited is *ipso facto* evil. But none of their explanations are satisfactory, for reasons which here cannot be stated in full. The difficulty is theological rather than scientific, i. e. it is only by reason of the assumption of an original condition of things in which no evil is ever potentially present that one makes it impossible to explain how evil and 'all our woe' first came into the perfect order. A scientific explanation of the origin is a statement of the conditions and causes of evil. This in general is accomplished in the first part of this article. In detail, the problem is one that has to be handed over to the practical sciences such as ethics, economics, political theory, etc.

EVIL, KING'S. See SCROFULA.

EVIL EYE. See MAGIC; SOPHIOLOGY; SUPERSTITION; WITCHCRAFT.

EVIL-MERODACH, ē′vĭl-mē̇-rō′dăk (the biblical form of the Babylonian *Avel-Marduk*, or *Amel-Marduk*, man of Marduk). A king of Babylonia, the son and successor of Nebuchadnezzar, who, after a reign of less than a year (B.C. 561-560), was put to death by his brother, Neriglissar (i.e. Nergal-shar-usur, "O Nergal! protect the King"). He is referred to in II. Kings xxv. 27 as having liberated Jehoiachim, King of Judah, in the 37th year of his captivity. No cuneiform inscriptions throwing light on Evil-Merodach's reign have been found, though his name appears on some contract tablets.

EVOLUTE AND INVOLUTE. The *evolute* of any curve is the locus of the centre of its osculating circle; i.e. of the centre of the curvature (see OSCULATING CIRCLE); and relative to its evolute, the curve is called the *involute*. The following example will show the relation between these curves. If on any curve, as the circle in the figure, a string be closely wrapped, fastened at one end and free at the other, and if the string be unwound from the curve, being kept taut, the curve traced by a pencil fixed to the free end of the string is the involute of that curve from which the string is unwound. The given curve is the evolute of the curve thus traced. This explains the two names. The normal to the involute at any point is a tangent to the evolute, as the construction suggests; and the difference in length between any two radii of curvature to the involute is equal to the length of the arc of the evolute intercepted between them. To Huygens (1673), who was among the first to investigate curves of this kind, is due the name evolute. He discovered that the evolute of the common cycloid (q.v.) is another cycloid equal to the first. The work in which these discussions occur is Huygens, *Horologium Oscillatorium* (Paris, 1673). See CURVES.



EVOLUTION (Lat. *evolutio*, from *evolvere*, to unroll, from *e*, out + *volvere*, to roll; connected with Goth. *walwjan*, AS. *wealwian*, Eng. *wallow*). The evolution theory, in its broadest aspect, undertakes to explain the origin of the universe, of all created things material and immaterial; and more especially the origin of our own planet, together with the plants and animals living and extinct, including man, his physical and mental nature. Applied to living beings we use the expressions 'organic evolution,' 'theory of descent,' 'origin of species,' 'transformation of species,' or 'transformism.' The theory of descent is supported by a range of facts as wide as the number and variety of forms of life, the species of plants and animals, living or fossil, entering into the millions. To appreciate properly the facts and arguments on which the theory is based one must be familiar with at least the elements of all the natural sciences, especially botany, zoölogy, and geology, and have done some original work on a group of organisms, besides having some degree of sympathy with the aims and methods of natural science. It should be borne in mind that in this single word *evolution* is comprised a study of the mode of action of that vast complex of natural conditions which has resulted in the formation of the stars and planets, and in the stocking of our earth with plants and animals each after their kind.

Evolution in general is based (1) on the unity of action of the processes of nature. We mean by the word 'nature' everything which has been generated, produced, or created. This, from a philosophical standpoint, implies an infinite power, or Creator, outside of and yet immanent in the material world, working by natural laws in and through matter, mind, and spirit. (2) The theory of descent, or organic evolution, is based on the principle of the unity of organization in plants and animals; (3) on the fact that the living substance known as protoplasm is the physical basis of life; (4) on the fact that all movements in the plant or animal body are due to the contractility of protoplasm; and (5) to the fact that all plants and animals arise from germs, seeds, or eggs. This does not exclude the view that the first germ of life—the primitive bit of protoplasm—arose by spontaneous generation.

DEFINITION AND CLASSIFICATION OF EVOLUTION. As will be seen by the historic summary at the end of this article, attempts have been made since the days of Empedocles and of Aristotle to explain the origin of the universe. The word 'evolution' originally was applied to such phenomena as that of the unfolding of a flower, or the development of an animal, and was used by Haller, Bonnet, and others, in speaking of the metamorphoses of the butterfly or frog. As a name for what we call evolution Wolff proposed in 1759 the word 'epigenesis,' and applied it to the mode of growth and development of the vertebrate embyro. See EPIGENESIS.

But for the modern use of the word 'evolution' we are indebted to Mr. Herbert Spencer. In his *Principles of Biology* (London, ed. of 1900) "the theory of organic evolution first found philosophic, as distinguished from merely scientific expression" (Osborn). It would be, perhaps, preferable to say that he used the word both in a philosophic and scientific sense. He gives us this highly generalized definition: "Evolution is an integration of matter and concomitant dissipation of motion, during which the matter passes from a relatively indefinite incoherent homogeneity, to a relatively definite coherent heterogeneity, and during which the retained motion (energy) undergoes a parallel transformation." The essence of his view is that there is a continual change in the organic world from the homogeneous to the heterogeneous, or from the generalized to the specialized. We are also indebted to Spencer for the apt expression 'survival of the fittest.'

Evolution in general may be divided into (1) inorganic; (2) organic; and (3) mental.

Inorganic Evolution. Under this head may be comprised the evolution of the cosmos or material universe; the evolution of our solar system. It is chiefly concerned with the evolution of our own planet, in the manner described by the framers of the nebular hypothesis (q.v.). It involves the gradual development of planets from primitive nebulous masses through the different gaseous stages of nebulæ, which have been happily called, by Clodd, "the raw material of which suns and systems are formed."

Planetary evolution has to take into account the formation of the air or atmosphere, of water, and the origin of the denser minerals comprised in the mass of planets.

Chemical evolution then follows. This is the gradual evolution, underlaid and conditioned by the physical forces of matter, from elementary or still simpler conditions, through compounds of various degrees of complexity to the most complex of all, i. e. protoplasm. In this substance physico-chemical evolution reached its farthest limits. Since life began inorganic chemistry has gone no further (Le Conte). It is now being recognized that something akin to evolution must have taken place in the elements, since the elementary atoms postulated by the chemist are themselves supposed to be wonderfully complex aggregates of yet smaller particles.

Organic Evolution. As we shall see, this is the theory of descent, or an attempt to account for the origin of organic species. The theory of descent, however—of the origin of species—was the result of attempts after the time of Linné to define and classify plants and animals. Owing to the perplexing variations of the living plants and animals, the difficulty of drawing the limits between the more variable species, the multiplication of specimens in our museums, showing a filiation between many species, though there were wide gaps between others, it became recognized by Lamarck that species were artificial, i.e. ideas; that the individual only was natural or existed in nature, and that the plant and the animal kingdoms should be represented by a genealogical tree, with its stem-forms and later derivatives.

As the knowledge of species increased, through the sciences of embryology, morphology, paleontology, and the new light thrown on the earth's history by great advances in geology, a sufficient fullness of knowledge resulted, and almost in a single year, 1859, the combined researches of the studies of plant and animal life in different quarters of the globe culminated in the epoch-making theory of descent proposed by Darwin, and by Wallace, independently of each other, and seconded by Hooker, Fritz Müller, Asa Gray, Huxley, and others.

Under the head of Organic Evolution we have the factors or agencies by which variation has been brought about, giving us the materials on which natural selection acts. The great facts in nature are adaptation and variation, and the causes of morphogenesis, of the origin of types and species, and all the actions of the physical agents, such as light, heat, cold; the chemical changes of the medium in which plants and animals live; changes in the environment, i.e. climate, temperature, altitude, and physiological changes, such as the use and disuse of organs, parasitism, and finally heredity. These are called the 'primary' factors of evolution, while 'natural selection' expresses the results of the action of these primary factors of organic evolution.

Mental Evolution. The actions of animals are physiological or reflex, instinctive, and rational. Man, with his exalted nervous vigor and brain power, alone thinks, reflects, or is self-conscious. It is probable that the more intelligent insects, and most of the vertebrates, are conscious agents. It is well-nigh impossible in the last analysis to draw the line between the mental acts of animals and man. The germs of reason exist in animals, and the intellectual qualities of man have with little doubt originated from those of the animals, wide as is the gap between the mental, moral, and spiritual nature of man, and the simple, elementary mental faculties of animals.

The result of this mental evolution—the physical evidence of which is seen in the great number of vestigial structures handed down from the higher mammals, in the cranial character of the highest existing races as compared with the fossil races, in his erect position, his culture-history, with its progressive steps, from primitive savagery up through barbarism to civilization—shows that at first brain use and development, the exercise of wit, cunning, craft, invention, skill, mastery over the elements, over the beasts, over himself; that high endeavor, the gradual elimination of savage impulses, success in the arts and sciences, due to his social mode of life, and finally a tireless devotion in the highest types of the race to the true, the beautiful, and the good, and appreciation of the divine in human nature, and, finally, the practice and exercise of love to God and to man—that all these have been the agents of his mental evolution, of his moral regeneration, and his devotion to his highest ideals, giving him the promise and potency of existence in another world than that witnessing his physical evolution, where his intellectual and spiritual forces shall have the freest play, unhampered by a struggle for mere animal existence, by competition with baser forces.

Species, Varieties, and Races. The individual is a concrete fact. A species is an induction, a generalization. (See Classification.) Our idea of most species is based on a pair or only a few individuals, whereas the actual number of individuals of most species may be counted by the thousands or even millions. Our conception of a species varies with the number of specimens in our collections; and systematists naturally differ greatly as to the limits of many species. The best definition of species is that of Lamarck: "A species is a collection of similar individuals which are perpetuated by generation in the same condition as long as their environment has not changed sufficiently to bring about variation in their habits, their character, and their forms."

A variety, or subspecies, is a group of individuals breeding true to each other, which resemble each other in color, size, etc., i. e. in characters less pronounced than those of species. Darwin calls a variety an incipient species, or a species in process of formation. Local varieties are fixed variations of species with a wide range; they are restricted to small areas shut in by mountain ranges, etc. They are thus due to different local environments, to differences in temperature, altitude, dryness or moisture, soil, etc. Local varieties, says Wallace, are the first steps in the transition from varieties to species. Varieties are subdivided into 'races,' though the two terms are often used interchangeably. Huxley calls a race 'a propagated variety.' Races are subdivided into 'breeds,' and these into 'strains'—the numerous breeds of pigeons, as the fantail, pouter, barb, tumbler, English carrier, etc., are examples of breeds, while a strain is the least recognizable variation from some racial form. Among domestic horses, we speak of the Arabian, Clyde, or Percheron breed; of the Morgan or Hambletonian strains. The American trotting horse is a breed which has been formed by artificial selection since the year 1822.

SPORTS. Much interest is now felt in the matter of 'sports' or aberrations. A sport may be defined as an individual which is born of ordinary parentage, but differs in some marked physical or mental characteristic. Sports in cultivated plants or domestic animals appear without any known cause, whereas aberrations in moths and butterflies are readily produced by artificial changes in temperature, humidity, or dryness. Among animals, the famous Ancon or otter sheep is as remarkable as any. By careful breeding with normal sheep, this long-bodied, crooked-legged sheep became the progenitor of a flock resembling the first aberration. Nature abhors aberrations, and by natural selection wipes them out. Yet Galton thinks that the transmutation of species is due to sports, which, if useful, are seized upon, and perpetuated by natural selection. With this view we sympathize, for the occurrence, claimed by Darwin, of vast numbers of intermediate forms between what are now 'valid' species, is a hard doctrine.

Sports may be divided (1) into 'teratoid' sports, the result of discontinuous variation, in fact monstrosities, and (2) 'biotic' sports, which are due to more or less sudden changes of the conditions of life.

The remarkable experiments of Standfuss show that in lepidoptera the crossing of an aberration with the parent form may often result not in the production of intermediate types, but in the sharp cleavage of offspring into two groups, each resembling one parent and not the other.

FACTORS OF ORGANIC EVOLUTION. We will now pass on to the mechanism of evolution, the means by which species and genera, and even orders, classes, and phyla, have been evolved. These factors are (1) changes in the environment, and (2) dynamic or physiological, i.e. the result of movement, strains and stresses, due to the exercise of organs.

EFFECTS OF CHANGES IN THE COSMICAL ENVIRONMENT OF THE GENESIS OF LIFE-FORMS. When the earth was cooling down from a gaseous to a solid condition, it is most probable that the changes in the cosmical environment had an immediate and creative or modifying effect on the beginnings of life. It is certain that the action of the same cosmical agents, such as motion, gravity, electricity, etc., which have determined the spherical shape of the planets, as well as of a drop of water, has been concerned in determining the shapes of cells, of eggs, of the simplest organisms, and is the basis of all physiological phenomena, as well as of motion in animals.

Plant and animal life are influenced in a way we do not understand by electricity; they are also influenced by variations in the pressure of the air. Jaeger claims that the force of gravitation is the primitive morphogenetic factor in the development of animals. In the growth of plants the influence of gravity and light is marked. The influence of gravity on the form of shells is noticeable. To this has been, by Hyatt, attributed the asymmetry of univalve shells.

The mechanical state of the medium is important in modifying the shape of animals. The spindle-shaped body of fishes enables them to cleave the water; so it is with the shapes of winged animals, whether insects, birds, or pterodactyls. When some terrestrial mammal was driven by necessity or competition with its fellows to seek a livelihood in the sea, and thus gave origin to the order of whales, its body underwent a transformation; it became fish-like in shape, and while from disuse it lost its hind limbs, the fore legs were converted into fins.

When animals of very different types, such as the earthworm, many sea-worms, multitudes of parasitic worms, the boring larvæ of insects, live in a denser medium than water, and have been obliged to burrow in the soil, or in the dense tissues of their hosts, the body tends to become elongated, cylindrical, and pointed at each end.

EFFECTS OF CHANGES IN THE CHEMICAL NATURE OF THE MEDIUM. Every one is aware how rapidly most sea animals, all except the migratory fishes, such as salmon, die when placed in fresh water. The effect of living by the sea on land plants is to thicken their leaves. The palisade cells are more numerous and larger than in leaves of the same plants when grown inland. Apparently, the sea-salt is the cause of this alteration, as plants cultivated in an artificially salted soil yield thicker leaves. Such a change as this is the result of the direct action of a changed environment.

The effect of a change from fresh to salt water on delicate forms, like the phyllopod crustaceans (Branchipus, etc.), is to dwarf them. Thus, the little brine-shrimp (q.v.) is apparently a dwarfed and otherwise modified form of some fresh-water ancestor.

Experiments have shown that the brine-shrimp varies greatly with differences in the density of the water in which it lives, with the result that here we have a transformation of one species into another. One form living in strong brine has a longer abdomen than others living in a weaker solution. This has been observed in nature, and also in forms living in the laboratory.

The lakes near the Sea of Aral are known to vary in degree of saltness at different seasons of the year; the result of this change from saline to comparatively fresh water causes marked variation in the pond-snails, so much so that the extreme varieties might be regarded as distinct species. So with the cockle-shells; the semi-fossil ones on the border of lakes which once formed a part of the Aral Sea vary greatly.

Effects of Changes of Light. Our light comes from the sun. Without sunlight there would be no life. Were it not for the stimulus of the sun's rays, animals would be eyeless; and it is the absence of light which bleaches animals living in darkness, preventing the formation and development of the pigment in the skin. On the other hand, the colors of animals, the beautiful and varied tints of butterflies and birds, of tropical shells as well as the gorgeous hues of flowers, are all due to the stimulating effects of light.

Light is necessary for the development of chlorophyll, and therefore is an indispensable agent in the life of all green plants, and especially for tree-life, and wood-formation. Sachs observes that "the forms and modes of life presented by plants . . . must have been to a large extent induced by the continued action of gravitation and light." And this applies as a general statement to the simple animals, and in a sense to all animal life.

The influence of changes in the environment, and especially of light, on organism, may be immediate and direct, or it may be indirect. The French botanist Bonnier has shown by experiments that a life in feeble light produces a change in the structure of plants, and that if placed in markedly different surroundings they either perish or become rapidly modified to meet the changed conditions. He has found that Arctic plants differ noticeably from the same species growing in Alpine regions in the greater thickness and simpler structure of the leaves, and has attributed this to the feeble light of the Arctic region and to the greater degree of moisture. By means of feeble electric lighting and a moist, cool temperature he had in his laboratory in Paris produced these differences, i. e. converted Alpine into Arctic plants.

Phototaxis. This means the influence of light in directing the movements of freely moving cells or unicellular plants, as certain bacteria. 'Heliotropism' means a turning to the light, as seen in the case of infusoria and many higher animals which will in an aquarium press to the light and collect on the side of the vessel next to the light. The influence of light on night-flying moths and other insects is well known. See Tropism.

Color Preference. Different animals have a marked preference for certain colors of the spectrum, in which they seem to feel better. The little crustacean Daphnia prefers to swim in orange, yellow, and especially in green light. The starfish shuns the red rays. Animals which love light, such as bees, prefer blue or green, while the light-shunning forms, such as ants, have less antipathy for red than for other colors. In these cases light doubtless acts as an excitant on respiration. It has been observed that slugs almost always move with reference to certain external agents, as gravity and strong light; they move in straight lines vertically either from or toward the light. It is so also with the Hydra, and starfish, as well as with the larvæ of certain starfish.

Colors of Animals Influenced by Light. It is well known that the chameleon and the Floridan Anolis lizard, as well as tree-toads, rapidly change their color from green to gray or brown, according as they rest among green leaves or on the trunk or branches of trees. The 'chromatic function' is that adaptation of the color of the skin of these animals, as well as of squids, crustaceans, etc., to that of their surroundings. This is due to the contraction or expansion of the pigment-cells (chromatophores) in the skin. The pigment differs in color in different individuals and species, and in different parts of the body, being yellow, brown, black, sometimes even red or green. On their distribution and their alternate expansion and contraction under the influence of the nervous system depends the pattern which the frog's skin displays at any given moment.

It is claimed by Biedemann that the color-cells change their shape as the result of the direct action of light and temperature. It appears that the slightest change of temperature affects the mutual disposition of the pigment-cells, and consequently the color, of the frog. Keeping the animal in the hand is enough to provoke a contraction of the black cells.

That the light acts as a direct stimulus has been proved by Steinach, who glued strips of black paper to the skin of frogs which were kept in the dark; when they were exposed to the light only the uncovered parts of their skin became paler, while the covered parts remained dark. To avoid all doubt, the experiments were repeated on skin separated from the body, and photograms of letters and flowers, cut out of black paper and glued to the skin, were reproduced upon it. Besides, blind tree-frogs do not become darker, as fishes do; and Biedemann has proved that the chief agency of their changes of color is not in the sensations derived from the eye, but in those derived from the skin.

The action of light also causes the varied hues and markings of the chrysalids of butterflies. During the semi-pupal state, before the chrysalis is fully formed, the surface is, so to speak, photographically sensitive to the color of the surroundings, and the gay hues of such pupæ are due to exposure to the surroundings. Thus, Poulton found that where the pupæ transformed in boxes, lined with black paper, they became dark, while white light produced pale ones, many of the last being brilliantly golden; this suggested gilt surroundings, which were far more efficient than white in producing chrysalids of a distinctly golden color, and even of a deeper hue than often occurs in nature.

The under side of flounders and other flatfish, as is well known, is white, owing to the absence of pigment, while the upper side of the body is dark, or variously spotted, or eyed. When the under side is dark, the fish will be found, according to Pouchet, to be blind.

By experiments in severing the connection of some of the spinal nerves with the sympathetic nerves of the same side, Pouchet succeeded in limiting the chromatic function to those spots where the nerves remained in connection with the sympathetic; and he was thus able to produce at pleasure a zebra-like marking on one side of a fish, while the other side retained its natural hues and their normal variation, according to the colors reflected from surrounding objects.

It is well known that small flounders and various kinds of shrimps will turn pale if placed in a white dish of salt water, and the red, green, and brown colors of shrimps and other crustaceans will change in a few hours in color to correspond with the green, red, or brown seaweeds in which they rest. This was carefully observed in the case of the prawn by Herdman, who also kept a number of specimens of different colors under observation in jars, with various colors of seaweeds and of background, and in very different degrees of light. The results showed that the adult animal can change its coloring very thoroughly, though not in a very short space of time. The change is due to alterations in the size and arrangement of the pigment-granules of the chromatophores.

It will be seen from these facts that the wonderful hues of tropical fish, with their colored bands, the stripes of snakes, or of the tiger, the spots of the leopard, the gay markings of caterpillars and of butterflies, as well as of spiders, are originally due to changes in light and shade. This will also apply to many of the protective markings of insects, and other animals; the initial cause or factor is the varying action of the sun's light, though natural selection may act as a secondary factor, those forms or varieties most protected by their special style of coloration surviving.

Effects of Darkness. On the other hand, the absence of light, or a life in perpetual darkness, has gravely modified the visual organs of cave animals and those living in the abysses of the sea. (See Cave Animals.) In the case of the blind beetles, crawfish, spiders, myriapods, etc., of caverns, we have the most obvious facts showing the direct action of the environment. The members of the fauna of our caves have their eyes variously affected: some are blind, others have vestiges of eyes, and others are completely eyeless. The cause is simply the result of disuse, for natural selection does not operate in such cases. The loss of eyesight and the scanty food renders the body slender, pale, colorless, while in compensation for the loss of sight, the tactile sense is greatly exalted; the antennæ, legs, and other appendages are remarkably long and slender compared with those of their out-of-doors relatives. The whole subject of cave life affords a most instructive example of the effects of the absence of light, the disuse of organs and their different degrees of atrophy, and other remarkable modifications of the body, and of use-inheritance, all brought about by the action of the primary factors of evolution, without the intervention of natural selection. It is proper to say, however, that Weissman and other ardent Darwinians account for the facts by natural selection.

Other animals live in holes in the sea-bottom, as some blind crustaceans and fishes, whose eyes in the very young are normal, also toward or at maturity become blind, and perhaps eyeless. The blind fishes and crustaceans of the deep sea afford similar instances. It is a significant fact that those animals, notably the fishes, are provided with phosphorescent organs.

Effects of Changes of Temperature. If a life in total darkness causes great variation and the origin of new forms adapted to strange conditions, so also great changes in temperature, as shown in nature, and by laboratory experiments, afford the strongest circumstantial evidence of the origin of new species by changes in the condition of life. It should be observed that variations due to changes of temperature are not fortuitous, but in direct relation to such changes of environment.

There is for each individual, and hence for each species, an optimum temperature which is most favorable to its welfare, and most favors nutrition, and hence growth and multiplication. On the other hand, extremes of cold (minimum) and of heat (maximum) are unfavorable and tend to cause death. Cold and its equivalent, altitude, tends to dwarf plants, shells, etc. When pond-snails are transported into a cold region, where the temperature is below the optimum, sexual maturity is reached before the animal has attained its full growth, and there is thus formed a dwarf race by simple change of climate. Hence this is the reason why Alpine and Arctic species are of very small size compared with those of lowlands in the temperate zone.

Certain plants, mollusks, crustaceans, etc., may become adapted to hot springs, constituting a thermal-spring fauna. Several kinds of mollusks live and prosper in the thermal waters of the Pyrenees, and of Dax, whose temperature varies from 25° to 35° C. (76° to 94° F.). A gastropod (*Melania tuberculata*) lives in the hot springs of Algeria in a temperature of 87° F., and a beetle (*Hydrobius orbicularis*) in the hot springs of Hammam-Meskoutine, with a temperature of 55° C. (130° F.); in cooler portions of the heated stream lives a little fish, and the freshwater crab (*Telphusa fluviatilis*). A small mollusk supports a heat of 122° F. in Italy, and another (*Neritina thermophila*) occurs in a hot spring in New Ireland, with a temperature of 122° and 140° F.

Finally, the supportable maximum appears to be confined between 105° and 113° F. It is known that at 122° F. protoplasm, at least in vertebrate animals, partially coagulates, and this causes death as by sunstroke, though Rotifera may withstand even 80° C., while Protista live in hot springs far above 60° C., and green algæ can survive 70° C. Yet, as we shall see further on, monads can be so modified by a gradual elevation of the temperature as to withstand the extreme of 158° F.

Very striking experiments have recently shown that varieties and species may be artificially produced by variations of temperature, which in some cases are like those in nature. This is as near an actual demonstration of the evolution of species as we can expect to reach. Mr. Wallace remarks that we have never seen a new species formed by natural selection; but in these temperature varieties we see how species have arisen by the direct action of a change in the environment.

Sudden changes cause death, but if the change is slow and gradual the animal may become adapted to or acclimatized in a temperature relatively high. By thus raising the temperature Dallinger practically produced a new temperature-race or variety of infusorian (Heteromita). For a period of over ten years he made observations on this infusorian. Observing that a new generation comes into existence every four minutes or so, it took years of experimentation to raise the temperature to 158° F. Beginning with the normal temperature of the water at 60° F., in four months he had raised it to 70°, without, however, affecting the monads, which continued to multiply by fission as vigorously as before. When 73° was reached, however, an adverse influence seemed to be excited on the organisms as regards their vitality and productiveness; but by keeping the temperature constant for two months the new generations became, so to speak, acclimatized, and in five months more the temperature was gradually raised to 78°. These experiments were continued until the temperature of 158° F. was reached, when an accident put an end to the experiments, and the new race thus adapted became extinct.

Another instance of the effects of changes in temperature is the case of a pond-snail (*Physa acuta*) which lived in the water of an artesian well with a temperature of 32° to 33° C. (c.90° F.); they were dwarfed and frequently deformed, but they reverted to their normal size when, owing to the diminution of the supply, the water became cooled at the end of two years. Owing to the great summer heat (104° F.) in the Transcaspian oasis, birds molt in summer. Dolbear states that the rate of the chirp of the cricket is entirely determined by the temperature; at 60° F. the frequency is 80 times a minute, and at 70° it chirps 120 times a minute.

Wasmann was able during three successive winters to induce parthenogenesis in the workers of an ant (*Formica sanguinea*), and in their helpers or slaves, by artificially warming the nests. On one day as many as twelve workers of this ant were seen laying eggs. Most of them were large workers, but small ones were also affected, and the smaller the ant the more tedious was the process of egg-laying. Of many hundreds of eggs thus laid none attained full development, as the eggs or larvæ were all devoured by the ants. Many mollusks common in France become in Africa (Algeria) doubled in size, while *Bulimus decollatus* becomes even nine times larger than in Europe.

On the other hand, cold is an efficient agent in modifying plants and animals. It is well known that fishes, caterpillars, etc., can be frozen, and, if gradually thawed out, become again active. One of the cabbage butterflies (*Pieris brassicæ*) may live through —20° C., and the European garden snail (*Helix pomatia*) survives refrigeration to 130° C., the lowest temperature which could be obtained (Yung). As is well known, the cold of highlands and of mountains, as well as an extreme northern climate, dwarfs man and animals as well as plants, while the proportions of the body are also changed. Salamanders, like the axolotl of Mexico, and the siredon of Lake Como, Wyo., under the influence of the elevation and low temperature, become retarded in their development; while the reproductive organs become accelerated in development and they breed while in the larval state. Parthenogenesis in aphids ceases at the approach of the autumnal cold.

Effects of Change of Climate. This has a much greater effect on the origination of varieties and species than is generally supposed. It was formerly the fashion to claim that climate had little or nothing to do with the origination of species. It is not improbable, however, that nearly a third or a half of the species in museums, or of those described in biological literature, are climatic or local varieties or species. The study of variation as now carried on, by measurements of great numbers of specimens, shows that each region, however limited, has its local race or breed, each of which differs from the others in slight yet constant features. And on general principles it is a change in the conditions of life, however slight, which reacts on the organism, and results in adaptation to the environment.

Local varieties are usually restricted to small circumscribed areas, separated by mountains, or by altitude, or by moist or dry regions; or, if marine, by different kinds of bottom, whether sandy, muddy, or rocky, or by different degrees of saltness of the water.

In the fresh-water fishes of the Pacific Slope each locality has its peculiar variety, which, in the aggregate, is different from the variety of every other locality (Gilbert and Evermann). These variations are due to the different environment, for the differences in temperature, altitude, and topography in the course of the different streams which take their rise in the Sierra Nevada are very marked. Indeed, whether we consider the insects, fishes, birds, or mammals in such a region as the Pacific Coast, which is undergoing rapid erosion or base-leveling, the number of local races, or, as some prefer to call them, local species, is remarkable. Packard has observed that species of moths which do not vary much on the Atlantic coast, where the topographical conditions are more stable, are in California exposed to very considerable variation.

Even in two neighboring lakes in Indiana (Lakes Turkey and Tippecanoe) the individuals of a darter (*Etheostoma capsodes*) from one lake differ constantly from those of the other lake in color, in the scales of the nape, and of the lateral line, in the number of spines in the anal fin, in the number of dorsal spines and rays (Moenkhaus). Similar instances are the absence of ventral fins in some of the fishes inhabiting even widely separated mountain lakes, and the presence of enlarged scales along the base of the anal fin in the cyprinoid fishes inhabiting the mountain streams of India; also the peculiar color patterns of the fishes in certain portions of northern Georgia See Isolation.

Introduced species tend to vary much more than in their native lands. Children born of British, German, or French parentage become in the United States slightly taller than their parents; the soldiers of the United States Army during the Civil War of 1861-65 were found, by measurements made on 1,110,000 individuals, to average taller than those of the British Army.

Dr. Bumpus has critically examined and measured over 1700 eggs of the English sparrow, one-half from England and the other half collected at Providence, R. I. He found that the eggs of the new or American race or breed vary much more than the European, differing in being smaller and of a strikingly different shape, being more rounded, and with a greater amount of color-variation. His measurements of the European periwinkle (*Littorina littorea*), 3000 from England, and 3000 from New England, afforded similar results. Since its introduction, about 1855, into the Bay of Chaleurs and its rapid spread along the coast to New York, this little mollusk has undergone a transformation adapting it to the different conditions of our northeastern coast. It has become more elongated, lighter in weight, more bulky, and the color-markings are less pronounced. Also large collections, in some cases 1000, from Casco Bay, Wood's Hole, Seaconnet, Newport, and Bristol, were found to present constant variations at each locality, the curves of variation exhibited on the charts prepared by Dr. Bumpus being different for each locality. So it is with a European land-snail (*Helix nemoralis*) introduced within a few years into

Lexington, Va. In Europe this is an exceedingly variable species, but already of the 125 Virginian varieties found by Mr. Cockerell, 67 are new and unknown in Europe.

But by far the strongest and clearest evidence of the means by which species are originated are afforded by Dr. J. A. Allen in the case of our American birds and mammals, his results having been based on prolonged studies made upon a vast number of specimens from different localities. Our birds are found in passing from the Atlantic to the Pacific coast to vary in general size, in the size of the peripheral parts (wings, etc.), and in color, thus varying with latitude or longitude. There is an increase in size from the south northward, not only in individuals, but generally, though there are some exceptions. The largest species of each genus and family are northern, as in the cases of the fox and wolf, the latter being one-fifth larger in Alaska than are southern species of their kind. In the case of those birds which breed from New England to Florida, the southern ones are smaller and differ in color. Mammals and birds, in their southerly examples, have larger ears and feet, and the cattle have larger horns. The hares have less furry ears and naked soles; the sage-brush hare has longer ears southward; so with the large long-eared 'jack-rabbit.' In birds bill, claws, and tail are larger in southern species and all the largest-billed birds live in the tropics. This, however, is to be observed in sparrows, blackbirds, crows, thrushes, wrens, and warblers, in the quail, meadow-lark, and flicker. In Florida, forms with slender bills common to that State and to the North have beaks still more slender, longer, and decurved. Those with a short conical bill have thicker and longer bills than their northern relatives, though the birds themselves are smaller. It is so with the tail—the size of the body is the same as in the North, while the tail is proportionately larger and longer.

The color in mammals, as the red squirrel, changes in going southward from pale yellow or fulvous to rufous. Except three species, all squirrels living north of Mexico have the lower parts of the body white, while those inhabiting tropical Mexico have the lower parts fulvous, deep golden, orange, or even dark brownish-red. In birds the colors are so much stronger and darker in southern forms that they might with their smaller size and larger bills be regarded as distinct species. The blue-jay, cardinal, and other birds have, in the South, a more brilliant and intense hue; some species are mere black and red. In crossing from the Atlantic to the Pacific coast, Allen observes that there are three phases of color. On the Atlantic coast the birds are bright and strongly colored; on the great plains they are pallid, owing to the dryness; and on the humid, heavily wooded Pacific coast the hues are deep-colored or piceous, both in birds and mammals.

The same obtains in the Old World. The marsh-tit of Europe in warm, rainy regions has its browns intensified; in dry, sandy districts the plumage is paler; in the Arctic regions it varies in paleness, and in Kamchatka it is almost white (Dixon). The birds of the Galápagos Islands differ from their nearest allies of the South American mainland in their larger bills, shorter wings, longer tails, and darker colors. Besides this each of these islands has its local species or varieties, which do not pass from one island to the others.

Many other examples could be given, but enough has been stated to prove that in the past, as well as at present, changes in climate have had an all-powerful influence in the origination of species. To this factor, together with migration and geographical isolation, we may attribute a very large proportion of the known species of plant and animal life, and also the races of mankind.

SEASONAL DIMORPHISM. Ordinary sexual dimorphism is where there are two forms of one sex, the cause of such a modification being unknown. In seasonal dimorphism, however, the cause is due to changes of temperature. Thus by subjecting the chrysalids of lowland butterflies to prolonged cold in ice-chests Weismann proved that northern or alpine species are climatic or seasonal varieties. W. H. Edwards has shown that two of the four polymorphic forms of *Papilio Ajax* (i.e. *Walshii* and *Telamonides*) emerge from winter chrysalids, and *Papilio Marcellus* emerges from a second brood of summer chrysalids.

Cases of seasonal dimorphism frequently occur among tropical butterflies. While in the north or temperate zone we have winter and summer forms, in the tropics of India and of Africa there are wet-season and dry-season forms. It is curious that the difference between the two forms principally consists in the fact that one looks on the under side like a dry leaf, while the other is marked with eye-like spots or ocelli. Their identity has been proved by raising both forms from the same batch of eggs. This case appears to be due to the direct action of the season, in the dry form to dryness and heat, in the wet form to the moisture and coolness of the wet season. Weismann, however, maintains that these changes of climate or season are 'only the stimulus, not the actual causes,' the latter being the processes of selection, a quite hypothetical cause, although twenty years ago he attributed the change to the effect of change of temperature. Limitations of space forbid one enlarging on this fascinating theme, but we may briefly refer to the remarkable experiments of Standfuss, who, by subjecting pupæ of Swiss butterflies to heat or cold, has produced artificially true temperature varieties, as follows: (1) Seasonal forms, similar to those known in nature (*Vanessa cardui albus*, and *Papilio Machaon* to some extent). (2) Local forms and races similar to those which occur constantly in certain localities (*Vanessa urticæ*, *cardui*, and to some extent *Papilio Machaon* and *Vanessa Antiopa*). (3) Entirely exceptional forms or aberrations, also occurring from time to time in nature (*Vanessa Io*, *cardui*, *Argynnis*, *Aglaia*). (4) Phylogenetic forms, not now existing, "but which may either have existed in past epochs or may perhaps be destined to arise in the future" (*Vanessa Io*, *Antiopa*, *Atalanta*). The conclusion from this and experiments by others shows, as Standfuss claims, that such forms are the result of the direct action of a change in the temperature.

EFFECTS OF CHANGE OF FOOD. While changes of light, heat or cold, moisture and dryness, are fundamental factors in causing variation, the abundance or scarcity and the nature of the food are an equally potent agency, not only affecting growth and reproduction, but in producing variation, and, by causing a change in habits, in bringing about profound modifications of the body. We will begin with the simplest organisms. Maupas believes that the reproductive power of ciliate infusoria depends (1) on the quality and quantity of food; (2) on the temperature; and (3) on the alimentary adaptation of the buccal organ. With favorable nutrition an infusorian (*Stylonichia pustulata*) undergoes self-division once in twenty-four hours at a temperature of 7° to 10° C. (42° to 50° F.), twice at 10° to 15° C. (50° to 60° F.), thrice at 15° to 20° C. (60° to 69° F.), four times at 20° to 24° C. (69° to 76° F.), and five times at 24° to 27° C. (76° to 80° F.). Thus at a temperature of from 25° to 26° C. (76° to 80° F.) a single Stylonichia would in 7½ days have a progeny of 100,000,000,000, estimated to weigh 100 kilograms (about 230 pounds). With a vegetable diet the rate is much less and the size smaller. Maupas also shows that infusoria continue to multiply by fission until the supply of food fails, when hunger leads them to conjugate.

Polymorphism. It now appears that the polymorphism of the social insects is due to the nature and amount of food. The existence of worker ants and bees, whose characteristics are not inherited from their parents, has been a stumbling-block to the theory of descent. As Darwin states it: "The difficulty lies in understanding how such correlated modifications of structure could have been slowly accumulated by natural selection"; the "acme of the difficulty" being "the fact that the neuters of several ants differ, not only from the fertile females and males, but from each other, sometimes to an almost incredible degree, and are thus divided into two or even three castes." The castes, moreover, do not commonly graduate into each other, but are perfectly well defined; being as distinct from each other as are any two species of the same genus, or rather as any two genera of the same family. It has also been found by Wheeler that in a Texan ant the several castes are at first all alike, the remarkable differences between the large and small-headed workers being due to differences in the amount and nature of the food.

It is well known that the larvæ of the worker honey-bees are fed with much less nutritious food than those of the queens, which are fed on 'pap' or 'bee-milk,' a highly nitrogenous food, which has apparently a singular power of developing the reproductive glands. The white ants (Termitidæ) are remarkable for the polymorphism of the species, there being in one kind eight castes, among them workers with small heads, and others with large heads, and soldiers of two castes, i.e. small-headed and large-headed. It has been found by Grassi that all these castes are born alike, and that the differences between the castes are chiefly due to the varying nature of the food, and have nothing to do with heredity. The small-headed forms have a scanty diet, live on refuse matter, and even eat their own excrement, this being used in the construction of their galleries. The soldiers live on sick or disabled companions. The young are fed only with saliva. From these facts it appears that the amount and nature of the food is the chief cause of the wonderful differentiation of the castes of the social insects; besides this there are the results of the division of labor in the community, use and disuse, together with specialization of labor, arising from the varied life of the populous colony.

Difference in the amount and nature of the food, involving low or under and high feeding, results in a discrepancy in the number of individuals of either sex.

It is now clear that a preponderance in the number of females is the result of high or better feeding. Yung experimented on tadpoles and increased the proportion of females as the diet was improved. In the first brood, by feeding one set with beef, the percentage of females rose from 54 to 78; in the second set, fed with fish, it rose from 61 to 81; while in the third lot, when the especially nutritious flesh of frogs was supplied, the percentage rose from 56 to 92, i.e. in the last case the result of high feeding was that there were 92 females to 8 males.

The result of Düsing's experiments with sheep leaves little doubt that abundant moisture and food tend to the production of females, while high temperature produces males. The heavier well-fed ewes brought forth ewes, while the lighter, under-fed ewes gave birth to males. Giron divided a flock of 300 ewes into two equal parts, of which one-half were extremely well fed and served by two young rams, while the others were served by two mature rams and kept poorly fed. The proportion of ewe lambs was 60 per cent. and 40 per cent., respectively.

Use and Disuse as Factors. Thus far we have considered the action of those factors which are concerned rather with the origination of varieties and species than of higher types; with the causes of specific variation rather than of the formation of genera, families, orders, classes, and branches or phyla. While gravity, light, and the allied factors evidently come into play in morphogenesis, the inquiry arises how the higher categories of organic forms originated. This must mainly have been accomplished through change of environment, inducing new needs, the formation of new habits, or change of function, all operating together and resulting in adaptations to the new mode of life. In all this the principle of use and disuse plays a most important part. See Disuse.

New Structures. An interesting example of the origin of a new structure due to change in habits and to resulting strains and movements is the formation of bivalve shells in animals of classes so unlike as the bivalve mollusks (Pelecypoda) and the ostracod, phyllopod, and phyllocaridan crustaceans. The shell or carapace has become folded into two valves to protect the body. The valves are opened and closed by the relaxation or contraction of one or two peculiar muscles, the adductors. These muscles are not homologous with any muscles in other classes, and at least in bivalve mollusks they are probably developed from the mantle muscle as a consequence of the conditions of the case. The several types thus occurring in different branches or phyla "is a strong proof that common forces acting on all alike have induced the resulting form" (Jackson). There are also good examples of mimicry or 'convergence,' and many so-called cases of mimicry are undoubtedly merely examples of such convergence or similarity of form due to the subjection of animals of quite different groups to identical habits or conditions.

Now, as the order of Crustacea is founded in part on the nature of the carapace, or of the limbs, whether adapted for walking, swimming, or biting, etc., the ordinal characters are evidently due to the different uses to which these parts are adapted. It is so with the classes of mollusks; the bivalves are secondary forms which by change of habits gradually evolved from some worm-like ancestor. The gastropods, with their unsymmetrical shells, and the creeping or swimming cephalopods, with their closely coiled shells (when a shell is present), are clearly the result of the use of certain parts, the disuse of others. So it is with the orders of mammals and birds, and the form of man is mainly due to the disuse of his feet in climbing, to his erect position, and to the use and exercise of his brain.

Coöperative Evidences of Evolution. That the general theory of evolution represents the truth of history and existing facts is supported by evidence from all departments of biology. The basis of morphology is anatomy and embryology. As soon as anatomists studied the mode of development of organs and traced their history from the germ, it was found that organs of the most diverse shape and use had had a common origin. Thus the arm of man, the fore leg of the lion, the flipper of the seal, the paddle of the whale, and a fish's fin were found to be morphologically identical—the same in origin and fundamental structure—while the wings of a bird and an insect were perceived to be simply analogous. Thus, what seemed the most diverse organs were found to have a common origin. Also cell studies proved that the cell is the unit of organic life.

Classification also yields evidence. It is now recognized that the plant and animal kingdoms may each be represented by a genealogical tree; that the members of different classes, orders, families, genera, species, and varieties are blood relations which have had a common descent from some primitive form, and that ultimately the vegetable and animal kingdoms have descended from a common ancestor. Taxonomy is an attempt to unravel these lines of descent. In classifying animals of any group (see Classification), we are constructing a phylogeny or genealogical tree.

Embryology furnishes an argument. The mode of development of an animal throws light on its affinities. Thus, the barnacle (q.v.) was supposed to be a mollusk until its development from a nauplius young, very similar to that of certain crustacea, proved that it is a member of that class. Mere resemblance between the young of members of different classes points unerringly to their common origin. Embryology (q.v.) teaches that all plants and animals have originated from a one-celled form. At one stage the fish, amphibian, reptile, bird, mammal, and even man are indistinguishable from each other, and the resemblance of the early embryo points to the origin of all vertebrates from some worm-like form. From his studies on the embryology of vertebrates, Von Baer first indicated the 'recapitulation theory'—i.e. that the different stages of development of a highly specialized animal constitute an epitome or recapitulation of that of the class or type to which it belongs.

As stated by Von Baer, and afterwards more fully by Agassiz, the law expresses a general fact. It was Fritz Müller who, in 1864, explicitly pointed out its evolutional or phylogenetic bearings, and in 1866 Haeckel restated the doctrine in the following words: "The developmental history (ontogeny) of an individual animal briefly recapitulates the history of the race (phylogeny)—i.e. the most important stages of organization which its ancestors have passed through appear again, even if somewhat modified in the development of individual animals."

Thanks to recent advances in morphology and embryology, and particularly to the study of vestigial structures, we are in a position to work out the phylogeny of the animal kingdom, or any group of it, with some approximation to exactitude. Even within the limits of a genus it is in some cases possible to detect vestiges of what were primitive characters, and thus to arrange in genealogical order the different species. It is this sort of work which gives new life, dignity, and importance to classification.

Vestigial Structures. The study of vestigial characters in highly specialized animals gives the clue to their ancestry. Thus, man has in his body about seventy vestigial structures which appear to be of no use to him; some, as the cæcal appendage (see Vermiform Appendix), a positive menace; and all these afford the strongest possible circumstantial evidence of his descent from an arboreal ancestor.

The study of the changes undergone by animals like the frog or butterfly after birth, or what we call 'metamorphosis,' is rich also in facts and suggestions which tend to prove that such wonderful changes are due to the action of the primary factors of organic evolution. It is so also with the hypermetamorphosis of certain insects. On the other hand, in groups of animals which normally undergo a metamorphosis development may, with a changed environment, be direct or abridged. It is so with the lobster, certain crabs, some insects, and especially some of the tree-toads of the West Indies and of South America. As examples, a Guadeloupe species of Hylodes (q.v.) is hatched in the form of the adult; since there are no marshes on the island, the tadpole state is suppressed, or passed through in an abbreviated way in the embryo. On the island of Martinique the young are tadpoles, but they are carried on the parent's back. The Surinam toad (Pipa) has similar breeding habits, yet the young have small gills, which, however, are of no use to them, as the tadpoles do not enter the water, but are carried about in cavities on the back, where the young pass through an abridged metamorphosis.

We have also seen that parthenogenesis (q.v.) is due to differences in temperature and food, while the alternation of generations (q.v.) of the hydroids is directly conditioned by the environment.

Geological Evidence. Our earth has had a history. Its age is approximately estimated to be about 50,000,000 years. Its history is divided by geologists into 'ages,' 'periods,' 'epochs,' etc. It is roughly estimated that about 30,000,000 years have elapsed since the deposition of the lowest fossiliferous rocks—those of Cambrian age. It is believed that this amount of time is sufficient for the origin and development of all the forms of life with which we are thus far acquainted. The stratified rocks are supposed to be about 20 miles thick, the earth's crust about 100 miles in average thickness.

During the enormous space of time since the Cambrian, the forces of life and nature have gone on much as at the present time, although the oceans and land masses down to the Glacial period practically had a subtropical climate. Yet there were revolutions, widespread changes of level in the relative distribution of land and water, so that the map of the world changed greatly at different periods. Hence there must have been successive changes of environment, the conditions of existence were unstable, there were vast migrations, and the founding of new colonies in regions opened up to migration resulting from the subsidence of one region and the elevation of another. Plateaus were elevated, mountain ranges formed, mountain peaks carved out of the mass of folded strata, and thus the entire plateau was finally worn down by the action of the rain and of rivers until the surface formed a peneplain. Such a history of topographical transformation occurred more than once on both the Atlantic and the Pacific coasts of the American continent. All these changes, these revolutions, such as the Appalachian and those of the Glacial period, exerted a profound influence on the flora and fauna. The great lesson of geology is the immensity of time and the ceaseless changes which have taken place in the physical geography of our globe; and these are of prime importance as respects the evolution of life on its surface and the variation of life forms; and yet there were long periods of rest, succeeded by local catastrophes and upheavals, though these so-called 'catastrophes,' however sudden geologically, may have extended through thousands of years. The breaks, as indicated by local unconformities in the strata of different ages, were confined to comparatively limited areas. So that periods of what we call rapid extinction of life were also periods of the comparatively rapid evolution and specialization of plants and animals.

The changes of level, the great elevation of the land in the Northern and Southern Hemispheres, the widespread and profound change of climate which ushered in the Glacial period, and the effect which the geologically sudden lowering of the climate had on plant and animal life, causing extensive migrations and adaptations (as of the polar plants and animals) to their frigid environment, afford signal examples of the effect of geological changes on the extinction of some and the modification of other forms. So also the enormous changes of level which occurred in Mesozoic and Tertiary times, when vast regions of the globe were carried up into the air, so to speak, and the climate changed from a tropical one to that of an elevated, cooler region. The very last changes of level which took place after the melting of the ice sheet, the drainage of continents, and the formation of extensive deserts, accompanied by the adaptation of much plant and animal life to them, should also be taken into account as producing variation.

Evidence from Paleontology. Huxley affirmed that the primary and direct evidence in favor of evolution can be furnished only by paleontology, and its evidence is, indeed, of the strongest nature, the discoveries and conclusions of paleontologists adding each year to the strength of the argument.

There are remains in the Cambrian rocks of fourteen classes of marine invertebrate animals and traces of primitive plants. The Cambrian annelids, trilobites, crustaceans, and other class forms are highly developed. Some, as the trilobites, are old-fashioned, generalized types; some of the crustacea are composite or generalized types, as the Phyllocarida; but the annelids are as highly specialized as their representatives of to-day. The earliest trilobites (q.v.) were blind or eyeless, though they may have descended from eyed forms. These and other facts strongly indicate that the Precambrian, including the Huronian, and possibly the Upper Laurentian ocean, supported an abundant life, made up of protozoans, sponges, and the ancestors of worms, mollusks, arthropods, etc., and most probably of the vertebrates. The Precambrian time was a period of the rapid evolution of types; stratigraphic geology shows that in this formative period there were widespread and rapid changes in the physical geography of the globe.

Another period of the apparently rapid evolution of life forms was the time of the Appalachian revolution, when vertebrates with lungs and limbs appeared, and the forerunners of reptiles, birds, and mammals probably originated. In these early times the Precambrian, as well as the opening ages of the Mesozoic, animal types were more plastic than now; dynamic evolution and use-inheritance did their work in the origination of class and ordinal types with comparative suddenness.

Paleontology teaches the fact of the rise, culmination, and death of types; the origin of life from generalized forms and their gradual modification and specialization. It is safe to say that the ancestral forms of most, if not all, the classes of animals began with composite or synthetic types. The geological succession of the arthropod classes, as well as those of the vertebrate phylum, all tell the same story. What morphology and embryology strongly suggest is emphatically confirmed by the series of fossil remains. The origin of reptiles, of birds, of mammals, and of man from generalized types is now placed beyond a reasonable doubt. Familiar examples of those principles or laws of organic evolution are afforded by the genealogy of the horse family (see Horse, Fossil; Camelidæ; etc.), the ox, deer, cat, and other families and orders of vertebrates. And so it is with the phyla into which the arthropods will have to be divided. There are lines of development which have undergone a continual course of modification by the rapid development by exercise of the brain, limbs, and teeth, and the reduction or atrophy of digits or teeth and other hard and soft parts.

On the other hand, certain types have never made any progress, and show little advance over their Paleozoic ancestors; such are the Foraminifera, the sponges, the corals, certain mollusks, as nautilus, king-crabs, Lingula, and even Ceratodus and Hatteria. Certain arthropods, as Peripatus, Scolopendrella, and Campodea, are probably persistent types.

Geological extinction has been due to obvious causes, such as changes in climate, the elevation of one area and the subsidence of another, as also to the competition with other types. If these causes are quite obvious in their results, it follows that the same causes which led to the extinction of some forms exerted an influence in modifying others. It should be observed that the imperfection of the geological record is still marked, but many gaps have in late years been closed. See EXTINCTION OF SPECIES.

EVIDENCE FROM GEOGRAPHICAL DISTRIBUTION. The present distribution (q.v.) of plants and animals can only be explained by reference to past geological changes in the shape and proportions of former continental masses and the resulting geological extinction. We can in many cases only account for the apparently sudden appearance of groups of highly specialized animals in a given area by invoking past migrations. Thus, the camel family (see CAMELIDÆ) originated in western North America, where it since died out, but is still surviving in South America and Asia. So with the ox family in Eurasia, and the elephants in northeastern Africa, the mammoth (q.v.) having migrated into North America by way of northeastern Asia. This interchange of forms between Eurasia and America, between Asia and Africa, between North and South America, and the changes of climate and other surroundings along the line of march, must have operated in inducing change of habits and variation, and, more especially by isolation, have led to the origin not only of new species and climatic varieties, but to the beginning of new generic and family types. Australia is, in many respects, notably in its characteristic mammals, a Jurassic continent, while Madagascar is a Tertiary island. The moa birds, peculiar to New Zealand, are the result of long ages of isolation and lack of competition with predatory animals.

The various modes of dispersal of organisms and their colonization in remote regions also throw light on the origin of species. The study of deep-sea life is instructive in this connection. It is now generally supposed that the abyssal or benthal fauna originated from shallow-water forms, and that the characters in which these animals differ from those living near the coast are adaptations to life at great depths. Indeed, all the facts and conclusions of zoögeography converge toward the view that as the different types evidently originated from this or that centre of distribution, so they had common ancestral forms.

BIOLOGICAL ENVIRONMENT. We owe to Darwin and to Wallace the facts and theories epitomized by the terms 'natural selection' (q.v.), 'struggle for existence,' and to Herbert Spencer the expression 'survival of the fittest.' The competition continually going on between the stronger and the weaker, between original stupidity and acquired wit and cunning, between the plant-eaters and the flesh-eaters, between parasites and their unwilling hosts, form a most important chapter in the story of evolution. As soon as, through the action of the primary factors of organic evolution, the ocean began to be peopled with the lowest, most primitive organisms, and when the process of specialization began to operate, then competition between this and that form sprang up, and the struggle for existence—for food, for place, for fixed abodes, or habitats, for a chance to live and multiply and dominate this or that area, and the rivalry of the sexes—set in. The result is *natural selection*, the elimination of the unadapted, of the 'unfit,' the weak and inept, and the success in life of this or that form which became the founder of some one of the immensely numerous groups of organisms now peopling the globe.

NATURAL SELECTION. After the earth became stocked with even a few comparatively simple forms, the selective principles in nature began to operate, resulting in the preservation of the fittest. The factor of natural selection, as stated by Wallace, is based first on "the enormous powers of increase in geometrical progression possessed by all organisms, and the inevitable struggle for existence among them"; and, in the second place, "the occurrence of much individual variation, combined with the hereditary transmission of such variations."

Animals tend to increase in enormous numbers, though, owing to the destruction of eggs and young by animals of their own or other species, the earth's population is scarcely greater now than ages ago. When we consider that the cod lays a million of eggs, and that many other animals are nearly as prolific, the species yet being represented by a constant number of individuals, we see that the rate of embryo and infant mortality is astonishingly great. What is called 'viability,' or the 'prospect of life,' in man, is in the lower animals reduced to almost infinitesimal proportions. A death-rate among us of more than 20 in a thousand excites alarm, but think of the death-rate in the cod, the bee, and most animals, where it reaches perhaps the figure of 999,998 out of 1,000,000. All this life is not, however, wasted. The young serve as food for other forms of life, and in this way the balance of nature is maintained, the too great increase in organic life is checked, and those that survive and reach maturity are, so to speak, adequately fed and housed. See LONGEVITY.

In formulating his theory of natural selection, Darwin assumed a tendency to variation, the causes of which he did not discuss at length. This variation, by insensible gradations, is, he believed, fortuitous or 'chance,' this word serving, he adds, "to acknowledge plainly our ignorance of the cause of each particular variation." The useful variations are those which survive. Natural selection, as Darwin claimed, "leads to divergence of character and to much extinction of the less-improved and intermediate forms of life," and he states: "It leads to the improvement of each creature in relation to its organic and inorganic conditions of life, and consequently, in most cases, to what must be regarded as an advance in organization." See NATURAL SELECTION.

PROTECTIVE MIMICRY. Much is said by Darwin, Wallace, Fritz Müller, Bates, and others on this subject, and natural selection appears to play an important part in bringing about protective resemblance. The initial causes of mimicry are the action of light, changes in temperature, etc., which have brought about a variety of patterns of color in insects and other animals of different groups. But it is difficult to account for the resemblance in form as well as coloration between the mimicker and the mimicked, unless we invoke the action of natural selection. The disguises of animals, danger signals, the bright spots, lines, bars, and other markings, primarily due, perhaps, to the action of light and shade, have been preserved and exaggerated by natural selection, the process resulting in the preservation of the species thus favored. For further facts and considerations relating to this phase of the subject, see NATURAL SELECTION; MIMICRY; and PROTECTIVE COLORATION.

Heredity. The work accomplished by the factors of evolution, including natural selection, would be all lost were the progressively developed characters not transmitted and fixed by heredity. Every one is familiar with the effects of the action of heredity. Its cause has been a mystery, now, however, in part cleared up. See Heredity; Use-Inheritance.

Parasitism. A very considerable portion of the animal world lives at the expense of its hosts. Whole orders of protozoans, worms, crustaceans, several families of hymenopterous and dipterous insects, numerically rich in species, and members of many other classes, derive their existence by simply living within the bodies of their hosts, or attaching themselves to some external part of their bodies. They infest the blood, the muscles, glands, and, in fact, may invade every organ and tissue in the body. A signal example of the good done by parasitic insects in preventing the overcrowding of the earth with injurious insects is the ichneumon fly (q.v.), a parasite of caterpillars, etc. The competition which is going on in the world of life is perhaps no better illustrated than by the work done by those deadly enemies of animal life of all grades, the disease germs or bacteria; yet the bacteria are met and devoured by wandering cells, whose mission it is to prey on such germs.

In short, by a study of these parasitic degenerate forms, in many of which there is a loss of limbs and other organs, we readily understand what a potent cause of profound modification by disuse the habit of parasitism may prove to be. In human history the occurrence of individual and racial weakness, backwardness, and decay due to the various forms of parasitic existence, including slavery, is a conspicuous source of physical and moral degeneration, and is exactly paralleled and illustrated among certain social insects. See Ant and Social Insects.

The Origin of Man. The proofs of man's origin from some other primate is now strong. Anatomically he presents no absolute differences from the anthropoid apes, except in the organs of speech. The relative differences between man and apes are very great, though chiefly confined to the capacity of the skull, the size, number, and complexity of the convolutions of the brain, and the specialization of the forearm in directions ministering to the behests of his brain. He passes through the same embryological phases as the higher mammals. Man's origin from some mammal is strongly attested by the presence in his body of a large number of vestigial characters, which indicate an ancestor that went on all fours—some features appearing shortly before and after birth, hinting at an ape ancestry. The scanty remains of the fossil races, that of Neanderthal or Spy, exhibit some primitive characters, but the discovery of the skull-cap, femur, and molar teeth of the Javan so-called 'missing link' (*Pithecanthropus erectus*) affords weighty evidence of the descent of man from some gibbon-like ape. (See Gibbon.) Experts in craniology state that the cranial capacity of this intermediate form is about 1000 cubic centimeters, while that of a few Australian skulls is even less than that (850 cubic centimeters). (See Pithecanthropus.) This creature stood erect, and was of the average height of man. Unless, then, new discoveries occur in some other tropical region, the view may be provisionally held that man arose in Java, or at least in southeastern Asia, where members of the lowest race of mankind—the Aëtas of the Philippines—still exist, and until recently the Kalang people of Java, a race of negritos allied to the Akkas of Central Africa.

At the outset man was a social being; his erect posture, large brain, hands, so well adapted to carrying out the suggestions of his developing intellect, so that he was the first tool-maker and worker in stone, bone, and wood, and the first being to tame other animals and to cultivate the soil—these qualities enable him to dominate all other animals. At first living a roving, solitary life as a hunter, tribal communities gradually arose here and there, living in fixed habitations and leading a sedentary life, and the developing man eventually became a herdsman, and after long ages a farmer. Even temporary cessations from intertribal wars were provocative of intellectual growth, and permitted the origin and growth of the germs of the arts and sciences. Meanwhile he began to migrate, and became, during the Paleolithic age, scattered over wide areas of the earth's surface. Then ensued a process of isolation by geographical and climatic barriers and the differentiation into races, the black being confined to Africa, the yellow to Asia, the red Indian to the Americas, while the cradle of the white race was in the region now including central and southern Europe, and Africa north of the Sahara and the Sudan.

The more civilized man grew, the more prolific he became. The lowest races early, as a rule, ceased to grow. The yellow races in subtropical regions advanced much further in the arts and sciences, but finally remained in a comparatively backward, semi-fossil condition.

Social Evolution. Up to a certain stage of development—that of the lowest savagery—the evolution of man was due to the action of the same transforming factors as affected lower organic life. The struggle for life, for food, for place, for preëminence, was, however, stronger in the human species than among the animals. Primitive man, his animal passions enhanced by his powerful emotions, stimulated by his growing imagination, his dawning intellectual forces, and his growing self-consciousness, rendered this new creature more cruel, bloodthirsty, and revengeful than the beasts. At first war did not tend to nation-building, but was a sporadic outbreak of intertribal inherited hate and revenge, with little result other than brutal sport and exercise. Marriage was little more than animal mating, ownership in property communal, and the primitive spoken language had not arisen out of signs and gestures, through picture-writing, into rude alphabets and a written language.

As soon as some scattered tribes had adopted a stationary mode of life, began to cultivate the soil, had domestic animals, and through various necessities made useful inventions, man began to live in a world of new ideas. With fixed abodes, family and tribal customs became handed down, finally becoming laws, and as the result of tribal combats patriotism and the social virtues took root. With ancestor-worship, reverence for the dead, ideas of a future life, poetry, art, architecture, sprang up. Commerce was, even in the earliest ages, as now, a great civilizer, as was ownership in flocks and herds and in land. Man began to have his individual rights, and the germs of morality, or the right relations between man and man, gradually evolved.

As the population of a given tribe or aggregate of tribes increased, there ensued a differentiation of the trades and arts, a separation into political and religious classes, and finally a degree of civilization, of which the Egyptian type was the earliest, in which an alphabet gradually replaced hieroglyphics, and a complicated religious ceremonial and theology superseded savage rites. The new man, with his moral nature enhanced, his imagination aroused, his memories of the past handed down by poets and scalds, his thoughts turning upward and away from animal existence, became gradually, in the noblest specimens of his race, actuated by entirely new sets of ideas, and the factors of his moral development began to act with increasing force.

Religious Evolution. Besides the purely moral factors, all through the course of man's development the religious feelings were constantly active and growing. The lowest savage practices religious rites, worships material emblems of a higher or supreme power, or fetishes which stand for a rude idea of worship (protection from the ills of life), while the most primitive man has some slight conception of a future life. Yielding to his murderous instincts, the earliest fratricide or thief, reflecting on his crime, would experience self-accusing feelings of remorse, and there would follow the expiation for the crime, or the feeling that one may be saved from the results of wrong-doing by propitiating the higher powers. The functions of the earliest physician, theologian, and philosopher were combined in the first 'medicine man,' and primitive theology also held the germs of primitive science. At first gross and materialistic conceptions of religion prevailed. Nature-worship was succeeded by polytheism, and this by monotheism. Theology has gradually been purified; genuine religion, besides the worship of goodness or God, has developed love for man, and the factors in religious evolution have been faith, hope, and charity, and an increased observance of the 'golden rule.'

Summary and Conclusion. Life appears to have been a necessary and inevitable result of inorganic or cosmic evolution. It came into being on our planet in the most natural way as soon as the temperature of the originally superheated planetary mass became sufficiently lowered, and the gaseous matter had been condensed into a universal sea. It arose by the action of physico-chemical laws, through what we call spontaneous generation, the materials for the formation of the first bit of living protoplasm being ready at hand. When once formed, motion, change, and the action of the primary factors, exerted through a great length of time, resulted in the differentiation or divergence of characters, and specialization went on, conditioned by and dependent on the increasing changes in the internal structure and physical geography of the globe.

Variation was most probably neither fortuitous nor by chance, but was due to changes in the environment, and therefore was necessarily in direct relation with such changes, resulting in the wonderful adaptation, variety, beauty, and harmony reigning through the organic world.

Putting together all the facts of geology and biology observed during the past century, a few of the more observant and thoughtful naturalists have, by the inductive method, to some extent worked out the mechanism of evolution. The theory is a good working one, indispensable in research. Still, we know only in part the guiding, controlling cause. There seems to be something more than the action of the physical factors and natural selection, which we cannot fathom. There has evidently been all through the process a modifying power, the nature of which science has not yet grasped. The striking fact in the whole course of evolution is that progress has been along certain useful and beneficent lines; that the ill-fitted, inadapted, degenerate, useless, however useful at first, have had to make way for higher forms better adapted to continually changing and improving conditions. Intelligence, mind, order, harmony, system, and good, rather than bad conditions, have resulted from and operated since the original chaos when physical force, energy, alone prevailed. There is a constant tendency seen in the evolution of the more favored human races toward improvement intellectual, moral, and spiritual. Epoch-making men, the highest representatives of our race, have shaped the age in which they lived, and in various directions given this and that impetus to the upward progress. There has been a directive force through it all, which has controlled and led life-forms along definite paths.

Natural selection alone, or the action of the primary factors, cannot entirely account for it. The universe, our world, life, and nature, were not self-evolved. It seems to be a reasonable induction that a self-conscious power and will outside of, and yet immanent in, matter, gave the first impress to the nascent universe, what we call natural laws being the mode of working, and in some unknown way providing the germs of self-progress along improving lines.

The evolution theory and its implications, therefore, immeasurably enhance our conception of Deity, and suggest most strongly that there is a divinity which has shaped our ends. The outcome of the whole is optimism, hope, giving the certitude that man's future will brighten, and that as the ages roll on life will be far more worth living than even now.

History of the Evolution Theory. Aristotle (b.c. 384-322) may be regarded as the father of the theory of descent, although Empedocles has been credited with the conception. The latter taught in a vague way the fact of the gradual succession of life-forms from the less to the more perfect, though he did not claim any genetic relation, but believed that they were separately created. The wonderfully comprehensive mind of Aristotle, who was the first anatomist, conceived of a genetic series, of a chain of being from polyps to man; he perceived the wonderful adaptation in nature, the principle of the physiological division of labor, and regarded life as the function of the organism, not as a separate principle. He recognized the fact of heredity, atavism, and believed in the inheritance of mutilations.

The nearest approach which the didactic poet Lucretius made to the evolution idea is to be found in his account of the development of the faculties and arts among the human races.

Saint Augustine (a.d. 354-130) spoke of the creation of things by series of causes, and Thomas Aquinas (1226-74) expounded and upheld Saint

Augustine's view. But the dogma of special creation became the universal teaching from the middle of the sixteenth to the middle of the nineteenth century.

That broad-minded early German philosopher Leibnitz (1646-1716) gave examples of the gradation of characters between living and extinct forms as proofs of the universal gradation or connection between species. He believed in a chain of being, and that the different classes of animals are so closely united that there are no gaps between them. He also suggested that by means of great changes of habitat 'even the species of animals are often changed;' he also taught the doctrine of the continuity of nature, and was the author of the saying, *Natura non facit saltum.*

Buffon (1707-88) thoroughly read and was influenced by Leibnitz's writings. Whether or not he owed his evolutional views to Leibnitz, he stated, and as frequently denied, the mutability of species. He suggested that such changes were directly produced by changes in climate, food, and domestication, and he gave a few examples of the effects of disuse, and held that all animals were possibly derived from a single type.

A stronger, more observant and bolder reasoner than Buffon was Erasmus Darwin (q.v.), the grandfather of Charles Darwin. He was a country doctor, not a working naturalist, but a remarkably close observer, and a sound thinker. He claimed that all animals were derived from 'a single filament,' insisted on the effects of changes of climate, of use, characters being produced by the exertion of animals. He was the first to propose the factor of sexual selection, stated the principle of the law of battle, quite fully elaborated the idea of protective mimicry, and vaguely stated the doctrine of use-inheritance.

The true founder of evolution, however, was Lamarck (q.v.), who was the leading zoölogist of the period between Linnæus and Cuvier (1744-1829). In 1801 he first published his evolutionist views. He taught in his lectures (1801-1806), and in his *Philosophie zoölogique* (Paris, 1809), that all organisms arose from germs; that development was from the simple to the complex; that the animal series was not continuous, but tree-like; and he constructed the first phylogenetic tree. The Lamarckian factors are the changes of environment, climate, soil, food, and temperature, such changes being direct in plants and the lowest animals, indirect in the higher animals. He speaks of the struggle for existence, stating that the stronger devour the weaker, and refers to competition. He discussed at length the effects of use and disuse, taught that vestigial structures are the remains of organs actively used by the ancestors of existing forms, and claimed that new wants or necessities induced by changes of climate, habitat, etc., result in the production of new propensities, new habits, and new functions. Change of habits, he says, originate organs, change of functions create new organs, and the formation of new habits precedes the origin of new organs or modification of organs already formed. He refers to the swamping effects of crossing, and to isolation as a factor. His definition of species is the most satisfactory yet stated. Lamarck's views were not generally accepted, but misrepresented or ignored, largely through the influence of Cuvier and his disciples. See LAMARCKISM; NEOLAMARCKISM.

Notwithstanding this history, it was reserved for Charles Darwin, in 1859, seconded by A. R. Wallace, to convert the scientific world to evolutional views. The new theory he specially advocated was that of natural selection. Darwin claimed that there was a universal tendency of fortuitous variation; its causes, he thought, were only in part known. He showed that favorable variations were preserved, and that natural selection has a directive force. He dwelt convincingly on the facts of competition, of the struggle for existence, and on the biological environment. At the same time his *Origin of Species* was a massive and irresistible argument for the doctrine of descent; and as further expounded and upheld by Hooker, Huxley, Fritz Müller, Haeckel, and others, it became generally accepted. Darwin was the prince of observers and experimenters. He was also an expert systematist, a clear, persuasive writer; and into whatever field he entered his work was epoch-making.

Meanwhile in England, as early as 1852, Herbert Spencer advocated evolution from a philosophical point of view. He proposed the term evolution both for the inorganic and organic world. His broad, synthetic mind grasped the full significance of cosmic evolution, and he extended the doctrine of descent to human history, human society, morals, ethics, and religion. He is the philosopher of science, and of all that pertains to man. He has worked rather along Lamarckian lines, holding that natural selection as such was of secondary importance, as compared with the primary factors of organic evolution.

Since Darwin's death, under the leadership of Alfred Russel Wallace, and especially of Weismann, the School of Neo-Darwinism (q.v.) has arisen. Weismann, distinguished by his great work on the embryology and metamorphism of insects, and his investigations on temperature forms, has shown that heredity has a physical basis, the chromatin being the bearer of heredity. He asserts the 'all-sufficiency' of natural selection, and claims that variability is due to sexual reproduction.

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EVOLUTION (in mathematics). See INVOLUTION.

EVOLUTIONS, MILITARY. The movements by which bodies of troops are enabled to change position, order, or formation. The term embraces such movements as changes of front, formations of line, column, échelon, or square. While the primary principles of scientific warfare remain practically the same, the modern developments of artillery and musketry fire have greatly affected the dispositions of battlefields, and consequently changed the essential principles involved in preparations for war. The ability of infantry, for instance, to wheel accurately, coolly, and with precision, or deploy in front of the enemy, with the steady deliberation of the parade ground, formerly so much admired, is to-day replaced completely by widely extended intervals in any line formation. Changes of front are now made speedily, the men moving by the shortest possible direction to their new front. In brief, the spirit of the old order of military evolution was to stamp out all individuality in the rank and file, making of the soldier an automaton of little or no value as a separate entity. Modern evolutions, on the other hand, magnify the individual, encourage individuality, and from time to time decrease the tactical unit of command. See TACTICS, MILITARY.

ÉVORA, â'vô-râ. A city of Portugal, capital of the Province of Alemetejo, situated in a fertil and elevated plain, 75 miles east by south of Lisbon (Map: Portugal, B 3). It is irregularly built, with narrow streets, and is protected by old walls and towers and some recently constructed fortifications. It contains remains of great historic interest. The Gothic cathedral dates from the twelfth century, and has considerable architectural beauty. Of Roman antiquities there are a ruined temple of Diana with fine Corinthian columns and an old aqueduct (rebuilt) which supplies the city with water. Evora has been the seat of an archbishop since the sixteenth century, and has an archiepiscopal library with about 25,000 volumes and 2000 manuscripts, and a number of paintings. The archæological museum is one of the most interesting in Portugal. The town has cotton and woolen manufactures, and iron furnaces. It carries on a considerable trade in wine. Population, in 1890, 15,134; in 1900, 16,152. Evora, the ancient Ebora, was captured by the Romans in B.C. 80, and became a colony with the name *Liberalitas Julia*. It was taken by the Arabs in 712, but was recovered by the Christians in 1166.

ÉVREUX, ā'vrē'. The capital of the French Department of Eure, Normandy, on the Iton, a feeder of the Eure, 67 miles west-northwest of Paris by rail (Map: France, G 3). It is an old-fashioned town with wide streets, having numerous promenades in the vicinity. The principal building is the cathedral, which dates from the eleventh century.

It is a composite of various styles of architecture, one of the most interesting features being the north portal built in the flamboyant style of the sixteenth century. The other buildings of note are the Abbey Church of Saint Taurin, originally built over the tomb of Saint Taurin, the first Bishop of Evreux, and having a shrine executed in the thirteenth century, which once contained his relics; the bishop's palace, built in 1484; and the Tour de l'Horloge (clock-tower) of the same century. Evreux has two theological seminaries, a lycée, a library and a small museum situated in the town hall, and containing numerous relics found in the vicinity of Evreux. The manufacturing establishments include linen-mills, foundries, and breweries. Population, of commune, 1901, 18,292. Evreux was taken by Clovis from the Romans; was sacked and plundered in 892 by the Northmen under Rollo; was burned by Henry I. of England in 1119; and in 1194 and again in 1199 was captured by Philip Augustus, King of France. It was frequently taken and retaken in the wars of the fifteenth century between France and England.

VIEIL EVREUX (*Old Evreux*), a village near Evreux, is the site of ancient Mediolanum and has remains of a theatre, an aqueduct, and fortifications. Population, in 1901, 275.

EWALD, ā′vȧlt, GEORG HEINRICH AUGUST VON (1803-75). A German Orientalist and theologian. He was born and educated at Göttingen, and in 1823 was appointed instructor in the gymnasium of Wolfenbüttel. In the following year he was made lecturer in the theological faculty of Göttingen, and three years later he became professor extraordinarius of Oriental languages. His full professorship was granted him in 1831. Having become involved, together with the brothers Grimm, Dahlmann, Gervinus, Albrecht, and Weber, in the protest against the abrogation of the Constitution which the King of Hanover had been obliged to grant in 1830, Ewald was removed from his professorship in 1837. He went in the following year to Tübingen as professor in the philosophical faculty, from which he changed in 1841 to the theological. Here, however, he became involved in controversies with the Catholics, Hegelians, and Pietists. He left Tübingen after having been ennobled by the King of Württemberg, and was reinstated in his old position at Göttingen in 1848. For many years, in addition to his professorial duties, Ewald was engaged in active support of the movement for Protestant reform in Germany. After Hanover was annexed to Prussia, in October, 1866, his loyalty to the dethroned dynasty caused him to refuse to take the oath of allegiance to the King of Prussia. As a result of this decision, and of certain expressions of opinion, he was removed from his position, and pensioned in 1868. Ewald represented repeatedly the city of Hanover as a member of the Guelph faction in the North German and German Diets.

Ewald wielded an immense influence as a scholar, and his learning was profound. His work was, however, marred by his dogmatic and controversial spirit. His writings, excepting his expressions on political subjects, which were merely temporary in their interest, were almost entirely on the Old and New Testaments and on Arabic. Among his important contributions to Hebrew philology and theology may be named his *Ausführliches Lehrbuch der hebräischen Sprache* (8th ed. 1870); *Hebräische Sprachlehre für Anfänger* (4th ed. 1874); *Geschichte des Volkes Israel* (7 vols., 3d ed., 1864-70); *Die Altertümer des Volkes Israel* (3d ed. 1866); and *Die Lehre der Bibel von Gott oder Theologie des alten und neuen Bundes* (4 vols., 1871-78). Of Ewald's treatises on other Semitic languages, the principal ones are: *Grammatica Critica Linguæ Arabicæ* (2 vols., 1831-33); *Abhandlung über des äthiopischen Buches Henókh Entstehung* (1854); *Ueber die phönikischen Ansichten von der Weltschöpfung und den geschichtlichen Wert Sanchuniathons* (1857). Of a more miscellaneous character are his *Sprachwissenschaftliche Abhandlungen* (3 parts, 1861-71); *Verzeichniss der orientalischen Handschriften der Universitätsbibliothek zu Tübingen* (1839); *Ueber einige ältere Sanskritmetra* (1827). Ewald was also the founder (1837) and one of the editors of the *Zeitschrift für die Kunde des Morgenlandes* as well as of the *Jahrbücher der biblischen Wissenschaft* (1849-65).

EWBANK, ū′bănk, THOMAS (1792-1870). An American scientist and writer. He was born in Durham, England, but emigrated to America about 1819, and from 1820 to 1836 was engaged in the manufacture of metallic tubing. From 1849 until 1852 he was United States Commissioner of Patents. Among his many publications are: *A Descriptive and Historical Account of Hydraulic and Other Machines, Ancient and Modern* (1842; 15th ed. 1863); *The World a Workshop, or the Physical Relation of Man to the Earth* (1855); *Thoughts on Matter and Force* (1858); and *Reminiscences in the Patent Office* (1859).

EWE. A speech group of pagan negro peoples on the slave coast of Africa in Dahomey and Togoland. Keane gives the following list of peoples speaking dialects of Ewe: *Awuna*, *Avenor*, and *Ataklu*, 45 miles inland on the Volta; *Agbosimi*, and *Aflao*, coast from Volta to Togoland; *Krikor*, north of Aflao; *Togo*, coast of Togoland; *Geng*, Porto Seguro and Little Popo, Great Popo, between Little Popo and Whydah; *Dahoman*, inland between Great Popo and Kotonu; *Ewemi*, north of Kotonu; *Fra* and *Appi*, from Kotonu to Yoruba frontier; *Anfueh*, *Krepe*, and *Ewe-Awo*, Togoland; *Màhi* (Makki), *Affakpami*, *Aja*, north and west of Dahoman. See Keane, in Stanford's *Africa*, vol. i. (London, 1895).

EWELL, ū′el, BENJAMIN STODDERT (1810-94). An American educator. He was born in Washington, D. C., and was educated at West Point, where, after graduating in 1832, he was an instructor in mathematics until 1836. After three years as assistant engineer of the Baltimore and Susquehanna Railroad he became professor of mathematics at Hampden-Sidney College, Virginia, remaining there until 1846, and from 1846 to 1848 he held a similar position at Washington University, Lexington, Va. In the latter year began his long connection with William and Mary College, which ended only with his death. First elected to the chair of mathematics, he became president in 1854, a position which he held until 1888, save for the interval of the Civil War, in which he served in the Confederate army as colonel of a Virginia regiment, and as adjutant-general on the staff of Gen. Joseph E. Johnston. From 1888 until his death he was president emeritus.

EWELL, Richard Stoddert (1817-72). An American soldier, prominent in the Confederate service during the Civil War. He was born in Washington, D. C., graduated at West Point, and was assigned as lieutenant of dragoons in 1840, and served with distinction in the Mexican War, participating in the engagements at Contreras and Churubusco. He attained the rank of captain, took part in the suppression of the Apache outbreak in 1857, and, on the outbreak of the Civil War, in 1861, resigned his commission and entered the service of the Confederacy. As a major-general he commanded a division at the first and second battles of Bull Run, at Antietam, and under Jackson at Warrenton Turnpike, where he was severely wounded. After the death of Jackson at Chancellorsville he succeeded to his command with the rank of lieutenant-general, took part in the battles of Gettysburg and the Wilderness, and was finally captured with his entire corps by Sheridan, at Sailor's Creek, April 6, 1865. After the war he lived in retirement.

EWER, ū′ẽr, Ferdinand Cartwright (1826-83). An American clergyman of the Protestant Episcopal Church. Born at Nantucket, Mass., he graduated at Harvard in 1848, in 1849 became a journalist in California, and in 1858 was ordained a priest of the Protestant Episcopal Church. In 1858-60 he was rector of Grace Church, San Francisco, Cal., in 1860 was appointed assistant minister of Saint Ann's Church, New York City, and in 1862 rector of Christ Church. Because of his extremely ritualistic innovations he occasioned a disturbance in the parish, and found it best to resign. In 1871 he became rector of Saint Ignatius's Church, which was organized for him by his friends and sympathizers, and in which he developed very elaborately his ideas regarding the conduct of the service. His publications include: *Sermons on the Failure of Protestantism* (1869); *Catholicity in Its Relations to Protestantism and Romanism* (1878); and *Grammar of Theology* (1880).

EWING, ū′ĭng, Finis (1773-1841). An American clergyman, a founder of the Cumberland Presbyterian Church. He was born in Bedford County, Va., whence he removed to Tennessee, and later to Kentucky. In 1802 he was licensed to preach by the Cumberland presbytery, and for several years thereafter labored with much success as a revivalist. He formed, with two other clergymen, in 1810, the presbytery from which the Cumberland Presbyterian Church was developed. He was subsequently pastor at New Lebanon (Cooper County), Mo., in 1820-36, and at Lexington (Lafayette County) in the same State from 1836 until his death. His *Lectures on Important Subjects in Divinity* appeared in 1824. Consult Cossit, *Life and Times of Finis Ewing* (Nashville, 1853).

EWING, Hugh Boyle (1826—). An American lawyer, soldier, and diplomat. He was born at Lancaster, Ohio, studied at the United States Military Academy; in 1849 went to California by way of New Orleans and Texas, and upon his return in 1852 studied law, which he practiced at Saint Louis, Mo., in 1854-56, and at Leavenworth, Kan., in 1856-58. In 1861 he entered the United States Army as brigadier-inspector of Ohio Volunteers. He commanded a brigade at Antietam and Vicksburg, and at Chattanooga the division which constituted the advance guard of Sherman's army, and took Mission Ridge after a desperately contested struggle. He was appointed a brigadier-general in 1862 and brevetted major-general in 1865. From 1866 to 1870 he was United States Minister to The Hague. His publications include *A Castle in the Air* (1887), and *The Black List* (1893).

EWING, James Alfred, F.R.S. (1855—). A Scottish physicist and engineer. He was born at Dundee, March 27, 1855, and was educated at the high school and the University of Edinburgh. For several years he was assistant to Lord Kelvin and Professor Fleeming Jenkin. In 1878 he was appointed professor of mechanical engineering in the Imperial University of Tokio, and while in Japan he devoted himself assiduously to the study of earthquakes, devising seismographs to record the earth's vibrations during such disturbances. In 1883 he resigned to become a professor of engineering in the University College, Dundee, and in 1890 he was appointed to his present position of professor of mechanism and applied mechanics in the University of Cambridge. He is the author of a treatise on *Magnetic Induction in Iron and Other Metals* (1891), a work which followed a series of researches in the various phenomena of magnetism published in the *Philosophical Transactions* and the *Proceedings of the Royal Society*. Professor Ewing has invented a 'magnetic curve-tracer,' a 'hysteresis tester,' and a 'permeability bridge,' which are used by electrical engineers and steel-makers in testing the iron employed in the construction of dynamos and transformers. His work on earthquakes resulted in the publication of *Earthquake Measurement* by the University of Tokio in 1883, and other papers by the Seismological Society of Japan. He has also written *The Steam Engine and Other Heat Engines* (1894), and *The Strength of Materials* (1899).

EWING, Juliana Horatia (1841-85). An English writer of stories for children. She was born at Ecclesfield, Yorkshire, England, where her father, Alfred Gatty, was vicar. Her mother was Margaret Gatty, who wrote *Aunt Judy's Tales* (1858) and other stories, and started *Aunt Judy's Magazine* (1866). After the death of Mrs. Gatty (1873) the magazine was conducted for two years by Juliana and her sister. In the meantime (1867) Juliana had married Major Alexander Ewing, of the army pay department. Mrs. Ewing wrote her first story, *A Bit of Green*, for the *Monthly Packet* (July, 1861), but most of her work was contributed to her mother's magazine. Among her many delightful tales are *The Land of Lost Toys*, *Jackanapes*, and *The Story of a Short Life*. She died at Bath, May 13, 1885. Consult Gatty, *Juliana Ewing and Her Books* (London, 1885).

EWING, Thomas (1789-1871). An American statesman, born in Ohio County, Va. He graduated at the Ohio University at Athens in 1815. The year following he studied law and was admitted to the bar at Lancaster, where he began his practice. In 1831 he was elected as a Whig to the United States Senate. He was a strong advocate of the recharter of the United States Bank, and protested vigorously against the action of Jackson in withdrawing the Government deposits from it, and after the 'specie circular' of Secretary Woodbury was issued in 1836 proposed a measure for its annulment. After the expiration of his Senatorial term in 1837 he resumed the practice of his profession, but in 1841 entered President Harrison's Cabinet as Secretary of the Treasury. In 1849 Ewing again entered the Cabinet, this time as the first Secretary of the newly established Department of the Interior. In June, 1850, he was appointed by the Governor of Ohio a United States Senator, to serve the unexpired term of Thomas Corwin, who had resigned to enter Fillmore's newly constituted Cabinet as Secretary of the Treasury. He remained in the Senate until 1851. He was a delegate to the Peace Congress at Washington in 1861, but unreservedly supported the Lincoln Administration during the Civil War.

EXAMINATION (Lat. *examinatio*, from *examinare*, to examine, from *examen*, tongue of a balance, from *exigere*, to weigh, from *ex*, out + *agere*, to lead). The process of testing a student or a candidate from some scholastic, professional, or other position, with the purpose of discovering either the proficiency that has been attained in certain lines of study and of knowledge possessed or the capacity for doing certain lines of work in the future. Both of these purposes may enter into an examination and usually should, for it is the minimizing of the latter purpose that has caused so much criticism of the scholastic custom. The use of examinations as a test of fitness for civil service is discussed under the title CIVIL SERVICE. Aside from the Oriental, especially Chinese, civilization, which has had no educational influence on the West, the use of examinations as a scholastic test seems to have begun in the mediæval universities, where the conferring of the baccalaureate degree was conditioned upon the ability to define and explain terms before a company already possessed of the degree, and of the mastership or doctorate upon the ability to 'dispute' or to defend a thesis before a group or a faculty, each member of which was possessed of the degree sought. Since then examinations have become a practice of every part of the modern educational system, both as a test of the completion of the component part of the system, and as a test of fitness for admission into more advanced parts of the general system or into specific institutions.

It is the confusion of the two purposes that has given rise to some of the most complicated problems of modern education, chiefly because the test of a completed portion of work can become, even if not necessarily so, largely an exercise in memory, while the test of ability to undertake other and more advanced lines of work may have little relation to the excellence of the memorizing activities or to the possession of mere information. The use of examinations in the former sense may be extended so as to furnish a test of the standing or even of the financial support to be given to institutions. In this latter application it forms a feature of the public school system of the State of New York, and in a much more extended sense, though recently somewhat curtailed, of the elementary school system of England. When used as a test of knowledge, especially when some exterior end is sought, examinations may lead to serious injury to educational work: the work of instruction becomes formal, the intellectual discipline is superficial, and the information acquired is soon forgotten. When the passing of examinations becomes a prominent motive, the higher purposes and aims in education are lost sight of. These difficulties in connection with the uses of examinations are met in different ways. In England the examination of schools by competent inspectors has been substituted to a large extent as a test of the amount of governmental support granted. In the elementary grade of the American public schools, the recommendation of the teacher, based upon an intimate knowledge of the work of the child, is a partial if not a complete substitute for the multitude of examinations formerly given. For the very burdensome college entrance examination, both certification by schools and a combination of secondary school finals and college entrance examinations through a general board are being widely substituted. See COLLEGES, AMERICAN; OXFORD UNIVERSITY; CAMBRIDGE UNIVERSITY; NATIONAL EDUCATION, SYSTEMS OF.

Consult: Hadley, *The Education of the American Citizen* (New York, 1901); Latham, *The Action of Examinations* (Boston, 1886); Herbert, *The Sacrifice of Education to Examination* (London, 1889).

EXAMINATION. In judicial proceedings, the process by which the testimony of witnesses is elicited and sifted. It is ordinarily conducted by the counsel for the parties, although the trial judge has the right to ask questions of a witness at any time. The first examination on behalf of the party calling the witness is known as the direct examination, that on behalf of the opposite party as the cross-examination, and any further questioning by the first party is called re-direct examination. As a rule, the party calling a witness has no right to ask leading questions, that is, questions which suggest to the witness the answers which are desired by the examiner. It is the duty of the court to see that witnesses receive decent and respectful treatment from counsel. For a further discussion, see EVIDENCE; WITNESS; TORTURE, etc., and consult the authorities there cited; also Ballantine, *Experiences of a Barrister's Life* (New York, 1883).

EXAMINATION, PHYSICAL. In legal proceedings, the medical or surgical examination of a living person by judicial order or as a part of legal proceedings to determine the existence or the nature of a physical injury alleged to exist, or of a physiological condition upon which the rights of a party to the proceeding may depend. It is especially available in actions for personal injury due to willful violence or to negligence, and in cases of abortion, malpractice, and rape. Whether a court of justice has the power to compel a party to an action to submit to a physical examination is a question upon which judicial decisions are at variance. It has been answered in the negative by the United States Supreme Court and by courts of last resort in several of the States, while an affirmative answer has been given by many State tribunals. The power has been denied on the ground that the right of every individual to the possession and control of his own person is held sacred and carefully guarded by the common law. That right, it is said, is as much invaded by a compulsory stripping and exposure as by a blow.

Other courts have affirmed the existence of this power, on the ground that the end of litigation is justice, and that whenever the physical examination of a party litigant is necessary to the ascertainment of the truth and the award of justice, such examination may be ordered. The latter view has received statutory sanction in some of our States. (See ch. 721, N. Y. Laws, 1893.) Even where this view prevails, the exercise of the power is a matter of judicial discretion. A party has not the absolute right to compel his opponent to submit to a physical examination; and a court will order such examination only when the necessities of the case require it, and when it can be made without danger to the party's life or health, and without the infliction of serious pain. Watson, *On Damages for Personal Injuries* (Charlottesville, 1901).

EX'ANTHE'MA (Lat., from Gk. *ἐξάνθημα*, eruption, from *ἐξανθεῖν*, *exanthein*, to blossom out, from *ἐκ*, *ek*, out + *ἄνθος*, *anthos*, flower). A name applied to a class of febrile diseases (exanthemata), attended by distinctive eruptions on the skin, appearing at a definite period, and running a recognizable course. To this class belong smallpox, chicken-pox, measles, scarlet fever, and, according to some authorities, plague, typhus, erysipelas, etc. See FEVER.

EX'ARCH (Lat. *exarchus*, from Gk. *ἔξαρχος*, *exarchos*, leader, from *ἐξάρχειν*, *exarchein*, to lead out, from *ἐξ*, *ex*, out + *ἄρχειν*, *archein*, to lead). A title applied early in the sixth century to any officer in the Byzantine army, but restricted in the last decade of the century to the military governors in Italy and Africa. Because of the troubled conditions in these two countries the exarch had to be given absolute civil as well as military power. The Exarch of Italy, who resided at Ravenna (q.v.), ratified the election of the Bishop of Rome, controlled the finances, judged all appeals, and made all official appointments. For the end of the exarchate in Italy, see AISTULF. In the Christian Church exarch was originally a title of the bishops, afterwards of a bishop who presided over several others—a primate. After the Council of Chalcedon it was used as a title higher than metropolitan, but lower than patriarch. The exarch of monasteries was an official charged with the maintenance of discipline. The same title is also borne, in the modern Greek Church, by the person who 'visits' officially, as a legate of the patriarch, the provincial clergy and churches. Consult: Diehl, *Etudes sur l'administration byzantine dans l'exarchat de Ravenne* (Paris, 1888); and Ducange, *Glossarium ad Scriptores Mediæ et Infimæ Græcitatis* (Paris, 1688).

EXCAL'IBUR. The famous sword of King Arthur (q.v.). It was bestowed upon him in accordance with the promise of Merlin, by the Lady of the Lake, and at his death thrown by one of his faithful knights back into the waters of the lake, where it was grasped and borne beneath the surface by a mystic hand. Consult Tennyson's *Idylls of the King*.

EX CATH'EDRA (Lat., from the chair). A phrase originally used with reference to the decisions of the Pope or others high in authority, who, literally speaking, pronounced their judgments *ex cathedra*. The expression is now applied to authoritative assertion in general; to speak ex cathedra is to speak as if vested with full authority, without fear of contradiction or opposition. In the definition by the Vatican Council of Papal infallibility the expression is used as one of the limitations of the doctrine. The Pope is only held to be infallible when, among other things, "he speaks *ex cathedra*, i.e. when in the discharge of his office of pastor and teacher of all Christians, in virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals to be held by the whole Church."

EXCAVATING MACHINERY (from Lat, *excavare*, to hollow, from *ex*, out + *cavare*, to hollow, from *cavus*, hollow). This term embraces mechanical devices for excavating and loading earth used in the construction of railways, canals, reservoirs, etc. The two most important classes of excavating machines are dredges and steam shovels, which are described under those titles. The ordinary drag-scraper is one of the simplest forms of excavating machine; wheel-scrapers are roughly speaking drag-scraper bodies mounted on two wheels to facilitate their movement. Drag and wheel scrapers are hauled by horses and require a man to load and dump them. Scrapers of large size are sometimes arranged to be operated by cables, the cables being so arranged and so manœuvred by a steam-engine that they automatically fill, haul, dump, reverse, and return the scraper just as these operations are performed by hand and horse-power. A form of excavating machine called a grader, which is much used, consists of a four-wheeled vehicle with a strong frame from which a peculiar form of plow is rigidly suspended. This plow turns the earth onto a traveling belt, which extends diagonally upward at one side of the vehicle so that a wagon may be driven under its upper end to receive the discharge. Grapple-bucket excavators and continuous chain-bucket excavators have been made first from dredges of this type and quite extensively used, particularly in England, where the steam shovel has been less highly developed than in America. See ROADS.

EXCEL'SIOR (Lat., higher). (1) The motto of the State of New York. (2) A widely known poem of Longfellow (1841), suggested by the motto of New York, and beginning "The shades of night were falling fast." It tells of a youth bearing a banner with the motto Excelsior, who pressed on through the darkness to the summit of an Alpine mountain, and was found dead, still clasping the banner. The poem has been set to music and is one of the popular American college songs.

EXCELSIOR. A material of American invention, much used for packing purposes and as stuffing for mattresses and upholstery. Excelsior is not, as is often supposed, made from shavings, but directly from logs of wood. Poplar and basswood furnish the best material. The logs are first sawed into blocks 18 inches long, the usual length of a strip of excelsior. These blocks are split into two portions and thoroughly seasoned. The seasoned blocks are divided up lengthwise into parallel sections, spaced according to the desired fineness of the excelsior. This division is effected by knife-points which do not penetrate far enough to cause the block to fall apart. A following knife completes the process of separation, and the tiny fibres curl and commingle as they fall from the knife. An excelsior machine will make from 200 to 300 strokes a minute, each stroke cutting off a tier of fibres from the face of the block. Excelsior is packed in bales weighing 250 pounds. It is stated that from 35,000 to 45,000 tons are manufactured annually in the United States. It is exported to many foreign countries.

EXCEPTION (Lat. *exceptio*, from *excipere*, to except, from *ex*, out + *capere*, to take). In law: (a) A taking out or excluding something from the operation or effect of an instrument, statement, or the like. (b) An objection legally taken to testimony or other material matter in a legal proceeding. (c) The clause, writing, or statement by which either of these objects is accomplished; also the thing excepted or excepted to. When applied to a clause in a deed it means a provision that exempts something from the grant; as where the deed conveys a certain farm with the exception of a described piece of land or a designated building or tree. (Compare Reservation.) An exception in a statute exempts a person or thing from the operation of the enactment; and it is a rule of pleading in a criminal prosecution or in a civil suit for penalties under such a statute, that the indictment or complaint must negative the exception; that is, deny that the defendant or the alleged criminal act comes within the exception. In admiralty and equity practice, the term is applied to the proper method of bringing before the court an objection to the regularity or sufficiency of a pleading or proceeding. In this sense, an exception partakes of the nature of a pleading, performing the function of a special demurrer at common law.

The term is employed most frequently, however, in common-law actions to describe the formal signification of a party's objection to an adverse ruling of the court upon some point of law. It must be taken at the time of the ruling, or within a prescribed period thereafter, and should be entered upon the court's record, so that a proper bill of exceptions (q.v.) may be prepared for a review of the case by an appellate court. Consult the authorities referred to under Real Property; Pleading; Practice.

EXCESS (Lat. *excessus*, departure, from *excedere*, to depart, from *ex*, out + *cedere*, to go). The remainder arising from dividing one number by another is often called the excess, as in casting out nines in the test for divisibility. (See Checking.) In spherical trigonometry the excess of the sum of the angles of a spherical polygon over $n - 2$ straight angles (the sum of the angles of a plane polygon of the same number of sides) is called the spherical excess of the polygon; e.g. the spherical excess of a spherical triangle with the angles 90°, 127°, 40°, is 77°. When the area of a spherical triangle, compared with the area of the sphere on which it lies, is very small, it may be taken as the area of the plane triangle with sides of the same length as those of the spherical triangle, and with angles diminished by $\frac{1}{3}$ of the spherical excess. If S denotes the area of the spherical triangle, E its excess, and r the radius of the sphere, then $E = \frac{S}{r^2 \sin 1''}$. This formula is of use in triangulation (see Surveying) to check the excess as found from the observed angles.

EXCHANGE (OF. *exchanger*, *echanger*, Fr. *échanger*, It. *scambiare*, ML. *excambiare*, to exchange, from Lat. *ex*, out + ML. *cambiare*, Lat. *cambire*, to change, from OIr. *cimb*, tribute; connected with Gall. *cambos*, Ir. *camm.*, Welsh, Corn., Brit. *cam*, crooked). A term used in political economy to designate one phase of the economic process by which goods are produced in coöperation, and a share allotted to those who take part in it (distribution). The goods exchange so that each person obtains that which he needs for his consumption. In the older economic writings the term exchange was therefore applied to all the phenomena of commerce and trade. Questions of shipping, balance of trade, mercantile policy, in short the whole mechanism of exchange, as well as questions of value and price, were included in this department of political economy. The recognition of the fact, however, that the services of the merchant and the trader, who, by bringing goods from points where they are not needed to those where they are in demand, create what would have been designated as place value, and are thus akin to those of the manufacturer who gives a new and more desirable form to his materials, has led to the restriction of the term exchange to the phenomena of value, price, and money. See Political Economy; Money; Value.

EXCHANGE. The conversion of the money of one country into its equivalent in the money of another. The technical meaning of the word has now, however, come to be the difference between the actual value of money taken by the standard of bullion, in any two places, with relation to each other. If in New York it requires more than $500 to pay a debt of that amount in London, the rate of exchange is against the former town and in favor of the latter, an inhabitant of which can pay a debt of $500 in New York with less than that amount of bullion in London.

The operations of exchange are based on the principle of the cancellation of indebtedness, and can be best explained by simple example. If a New York merchant, A, buys goods from a London merchant, B, it would seem that the simplest way of discharging his indebtedness would be by the shipment of gold to London. But this primitive method is not the simplest. Such a shipment involves costs of transportation and insurance, which materially enhance the price paid. A simpler plan would be to have another London merchant, C, who owes money in New York, make the payment in London to A's creditor, while A in New York makes the payment to C's creditor at that point. This is in effect what actually takes place in the settlement of such debts, though neither A in New York nor C in London is under the necessity of ascertaining to whom payment must be made to cancel the two debts. This is done through the agency of the banks and bankers. A in New York goes to his banker and buys a draft upon London; C in his turn buys a draft upon New York. These two drafts cancel one another, and London pays New York, and New York London, without the shipment of specie.

In order to correspond to the facts of the actual world, these simple transactions must be multiplied by the thousandfold. The aggregate of the payments to be made by New York to London must be balanced off against those of London to New York. But can it be supposed that the balance is ever exact? As between two points only, this is probably never the case. How then can a balance be reached? In the first place, by associating with New York other places which do their banking through that centre. In this manner practical equality of demand between points is attained and exchange is at par. Costs of shipment are eliminated, and to pay a debt of £500 in London, the New York merchant pays the exact equivalent in American money of the fine gold contained in £500. But such equality of demand is rare. There is usually an excess of payments to be made by one point or the other. In such cases exchange rises above or falls below par. If New York has more payments to make upon London than London on New York, sterling exchange will be in demand. To secure the means of payment in London the New York merchant will pay more than the par, and exchange is at a premium. If the contrary case prevails, New York bankers in their desire to secure payments for London will offer them at less than par. The alternative of buying exchange is always the shipment of bullion, and when the premium upon exchange grows as large as the cost of shipping bullion, gold exports will begin. The cost of shipping bullion fixes, therefore, the maximum of exchange. In the last resort, therefore, the discrepancy in the relative demand of two points is liquidated by shipments of specie, but it is to be observed that it is only the balance which is shipped, and large amounts are settled by the principle of compensation. Before the specie movement begins, adjustment is frequently sought by the shipment of securities, and even of commodities. The rate of exchange is liable to be brought to a level by commercial exportation and importation, since, whenever it is expensive to get money sent to a country, there is a temptation to send goods to that country to compensate the debt. In the general circle of transactions of this kind, the State or town which has the largest amount of transactions will have the largest number of debtors and of creditors, and will afford the chief facility for each compensating the other. It is thus that London is the centre of the money market, where all the debits and credits of the world may be said to meet and extinguish each other. While the old notions about the balance of trade (q.v.) existed, it was supposed that the nation which the exchange was against was going to ruin, while that which it was in favor of was prospering through the other's loss. At present it is inconvenient and expensive to a country to have the exchange against it. An adverse exchange generally indicates a sort of break in the circle of trade which it would be advantageous to fill up, and *may* be caused by the commerce of a country decreasing; on the other hand, however, the imports for which a country pays in cash or in expensive bills may be the same as a highly advantageous traffic. Gold-producing countries find bullion their most advantageous export, and the same is the case with countries into which gold has flowed in excess.

Some confusion as to rates of exchange often occurs because of the failure to note the divergent practice of the London and other markets. In London they reckon how much foreign money can be purchased by a definite sum of the home currency. Thus the par of exchange between London and New York being £1 = $4.866½, London may reckon exchange at $4.84, in which case American money is dear and exchange at a premium. On the other hand, New York reckons the cost in American money of a definite quantity of foreign money. Thus, when sterling exchange is quoted at $4.84, English money is cheap and exchange below par. Consequently, in England, exchange 'falls' as the conditions become more unfavorable, while in the United States exchange 'rises' when the conditions become unfavorable. A failure to note this difference has been a fruitful cause of misunderstanding.

EXCHANGE. A term applied to an organization of merchants meeting at stated times, generally daily, for the transaction of business, as well as to the building in which such meetings occur. Here and in Great Britain a sharp line is generally drawn between stock exchanges, at present the most important form of exchanges and those devoted to other classes of transactions, but on the Continent of Europe this is not the case. There the exchange focuses the commercial life of the community at one point, and accordingly the buildings devoted to the purpose are frequently among the architectural ornaments of the city, as in Paris and Brussels. Whether there is a single exchange or several, the kindred purposes of all such organizations have developed a particular type of building. There is generally a large quadrangular space surrounded by an arcade, frequently with offices opening from the latter. The central space, the 'floor,' devoid of furniture—transactions of large amount being carried in the head or on the simplest memoranda—is reserved for the accredited members of the organization, while the arcade, or gallery, as the case may be, accommodates visitors. Offices for the manager and his assistants, and frequently reading and recreation rooms for the members, form a part of the equipment of such a building.

Exchanges as organizations are of quite early date, and we have no precise record of their original purposes. It is probable that they grew out of the mediæval guilds of merchants. The latter erected their own warehouses, and in the regulation of their use and the determination of trading customs and settlement of disputes in such guilds we see types of the activities of the modern exchanges. Many of the latter were founded early in the sixteenth century, especially in the Netherlands. The Royal Exchange of London dates from 1556, when it was established by Sir Thomas Gresham. Wherever they exist exchanges are primarily organizations of merchants with more or less recognition and control by the Government. In England and the United States they are simply private corporations chartered by the State, but on the Continent of Europe the Government takes an active part in their establishment and administration.

The main characteristic of dealings in exchanges is the fact that the goods dealt in are not physically present. There is not, as in the case of sales in a private establishment, opportunity for inspection of goods. It follows, therefore, that exchanges deal in standard goods only, or rather in such as may be definitely described. The purchaser of goods on an exchange does not buy specific goods, but rather a specific quantity of goods of a definite character. It is this feature which adapts the exchanges in so marked a degree to speculation. Persons buy and sell without contemplation of future delivery, but with reference to a future price. Settlements are expected and made, not by delivery of the goods, but by adjustment of the difference between the contract price and the price ruling in the market at the maturity of the contract.

Stocks, bonds, cotton, wool, grain, hides, provisions, and a few other commodities can be bought and sold in this fashion. Of these, the first and second are particularly adapted to such transactions, and stock exchanges are accordingly the most widely disseminated form of exchanges. In the United States separate exchanges generally exist for them, while the other commodities may be handled by a general produce exchange, or by separate organizations, depending upon certain historical antecedents or upon the importance of the staple in question for the trade of a particular place.

Stock exchanges and produce exchanges have many points of organization and procedure in common, but as stock exchanges are treated in a separate article, we shall confine our explanations here to produce exchanges, illustrating their methods and purposes by some account of the New York Produce Exchange.

This organization was originally chartered April 19, 1862, as the New York Commercial Association. Its purposes are declared by its charter to be "to provide and regulate a suitable room or rooms for a Produce Exchange in the city of New York, to inculcate just and equitable principles in trade, to establish and maintain uniformity in commercial usages, to acquire, preserve, and disseminate valuable business information, and to adjust controversies and misunderstandings between persons engaged in business." In 1868 an act amendatory to the charter changed the name to the New York Produce Exchange, while a further act of 1882 added to the declared purposes, that "to make provision for the widows and families of deceased members." The conduct of the affairs of the organization is vested in a board of managers consisting of the president, vice-president, treasurer, and twelve other managers elected annually by the association. The charter authorizes the board of managers to elect annually an arbitration committee composed of five persons not members of the board, whose duty it is to hear and decide controversies between members. On filing the award of the committee in the Supreme Court of the County and City of New York, judgment is entered according to the award. From such award there is no appeal except for frauds, collusion, or corruption of the arbitration committee or of its members. Other committees are named by the president. Of these, one of the most important is the complaint committee, which takes cognizance of all duly entered complaints against members. This body endeavors to conciliate the disputants, or induce them to resort to arbitration. Failing in this it may, if circumstances warrant, bring the matter before the board of managers, which may, when the charges against the defendant are substantiated, by vote of two thirds of the members present, censure, suspend, or expel him from the exchange. Other important committees are those on trade, which has to do with commercial usages, and the committee on information and statistics. In addition to the managers and various committees, there is a superintendent of the exchange charged with the details of management, the care of the building, and similar duties. Annual assessments of. not less than ten or more than thirty dollars, as the board may direct, form the basis of the revenues of the exchange.

In addition to general rules as to membership and the like, there are a series of special rules for the trade in provisions, lard, grain, flour, seeds, petroleum, oil, butter, cheese, and hops, maritime trade and steamship trade. These rules have much similarity, though they differ according to the nature of the business in question. Each set of rules defines standard grades in the commodity to which it refers. Thus in the rules governing the provision trade we find exact descriptions of what is meant by such familiar market terms as mess pork, prime mess pork, extra prime pork, and the like. The rules define also the quantities in which such goods shall be handled, and modes of packing and curing. They provide a system of inspection, and the board licenses inspectors to carry it out. Standard forms of contract, rules as to settlements, and similar matters are features of the rules. Far more complex are the rules governing the grain trade, but they do not differ in spirit.

Each exchange makes its own rules, such as are adapted to the locality in which it is situated, but for the same kinds of trade the rules have much in common. This is particularly true of all rules fixing definitions, as the various exchanges strive here especially to secure uniformity. An important function of all exchanges is the dissemination of information. Not only are the market reports published daily in the papers prepared under the supervision of the exchanges, but annual reports embracing a vast amount of statistical information are frequently published. See STOCK EXCHANGE; SPECULATION.

EXCHEQUER, CHANCELLOR OF THE (OF. *escheker*, Fr. *échiquier*, checker-board, alluding to the checkered cloth on which accounts were reckoned, from OF. *eschecs*, Fr. *échec*, chess, from Pers. *šāh*, OPers. *xšāyaθiya*, Skt. *kṣatriya*, king, from *kṣi*, to rule). In Great Britain the head of the Treasury Department. He must be a member of the Lower House, which holds control of the purse. When the Prime Minister is a member of the House of Commons, he sometimes holds the office of Chancellor of the Exchequer. The judicial functions of the Chancellor, which before the eighteenth century were of great importance, have disappeared. See EXCHEQUER, COURT OF.

EXCHEQUER, COURT OF. An English law court of great antiquity and importance, wherein matters relating to the royal revenues were adjudicated. It is said to have existed from the early times of the Conquest, and is supposed to have been denominated the 'exchequer' from the fact that a chequered cloth was wont to be laid upon the table of the court. Under the Norman kings it was a branch of the *Aula Regia*, or Great Council of the Nation. From the reign of Henry III. its existence as a separate court was recognized. Its special business continued to be the decision of revenue cases, but from an early period the court showed a tendency to extend its jurisdiction over the ordinary litigious business — the common pleas — of the country. This was done by establishing the fiction that all lieges were the Crown's debtors, whereby the Court of Exchequer acquired a concurrent jurisdiction with the other courts of common law. Besides its common-law jurisdiction, the Exchequer was distinguished from the King's Bench and Court of Common Pleas by having an equity side; but this was abolished in 1841, and its equitable jurisdiction transferred to the Court of Chancery. The judges of the Exchequer consisted originally of the Lord Treasurer, the Chancellor of the Exchequer, and three *puisne* judges (these last being called barons of the exchequer). The Chancellor of the Exchequer sat only on the equity side of the court; he has not been called upon to exercise his judicial functions since 1735. The Court of Exchequer was abolished as a separate court by the Judicature Act of 1873, and its jurisdiction transferred to the newly created High Court of Justice. See BARON; CURIA REGIS.

THE COURT OF EXCHEQUER CHAMBER was formerly a court of all the judges in England assembled for decision of matters of law. Originally established in the reign of Edward III., for the purpose of reviewing the decisions of the common-law side of the Court of Exchequer, it developed into a general court of error, in which capacity it revised the judgments of the other two courts of common law as well. In the reign of Elizabeth it was enacted that the judges of the Common Pleas and Exchequer should form a second Court of Exchequer Chamber, for review of certain cases in the Queen's Bench. But this intermediate court of appeal was abolished by the Judicature Act of 1873 as inconveniently composed and somewhat unnecessary.

In Scotland, before the Union, the *Exchequer* was the King's revenue court. A new court was established in the reign of Queen Anne having a private jurisdiction as to questions relating to revenues and customs of excise, and as to all honors and estates, real and personal, and forfeitures and penalties arising to the Crown within Scotland. But questions of title to honors, lands, etc., were reserved to the Court of Session. The judges of the court were the High Treasurer of Great Britain, the chief baron and four other barons, and English barristers as well as Scotch advocates were allowed to practice in the court. By a statute of William IV. it was provided that successors should not be appointed to such of the barons as should retire or die, and that the duties of the court should be discharged by a judge of the Court of Session. More recently by 19 and 20 Vict., c. 56, the Court of Exchequer has been abolished and its jurisdiction transferred to the Court of Session.

The Court of Exchequer Chamber in Ireland was established by 40 George III., ch. 39, but was abolished as an intermediate court of appeal between the Irish courts and the High Court in England. (See COURT.) Consult Madox, *History and Antiquities of the Exchequer of the Kings of England*, etc. (2d ed., London, 1769).

EXCHEQUER BILLS. Notes issued by the English Treasury or Exchequer for the purpose of supplying a temporary demand for money. Such bills were issued to meet temporary emergencies, with the expectation of repayment in a comparatively brief period. They bore interest and were payable at the option of the Government. At times they have been liquidated by payment from current revenues; at other times by conversion into funded debt. While the bills have some of the features of investments, they are, on the other hand, receivable at the public Treasury in payment of taxes, and the rate of interest upon them has been variable, according to the condition of the market at the time of issue. They were first introduced into England in the reign of William III., and have since been a conspicuous feature in English financial policy. Of late years, however, they have been generally superseded by the issue of Exchequer bonds. These differ from the bills in having a definite time to run, but otherwise they serve the same purpose. While the United States has issued in the past quarter of a century no obligations in any way analogous to the Exchequer bills and bonds, there are some striking points of resemblance between the latter and the Treasury notes which were a frequent device of American financiering before the outbreak of the Civil War. See TREASURY NOTES.

EXCHEQUER TALLIES. Seasoned wands of ash, hazel, or willow, formerly used for checking accounts in the English Exchequer. The sum acknowledged was inscribed on the tally, on the other side of which the same sum was inscribed in Roman characters, together with the payer's name. Notches marked upon the tally indicated by their form the class to which the account belonged. This tally was split, and the payer received one-half, which he presented for payment, and which was matched with the half remaining in the office.

EXCIPIENT (from Lat. *excipere,* to take out, from *ex,* out + *capere,* to take). An inert or slightly active substance, introduced into a medical prescription as a *vehicle* or medium of administration for the strictly medicinal ingredients, or to make up the necessary bulk. Thus, conserve of red roses, or bread-crumbs, or licorice powder, is used to make up pills; white sugar in medicinal powders; water, mucilage, white of egg, syrup, glycerin, and many other substances in fluid mixtures.

EXCISE, ĕx-sīz′ (MDutch *aksiis, aksys,* Ger. *Accise,* excise, from OF. *assis,* taxes, from *assise,* session, from *asseir,* Fr. *asseoir,* to sit, from Lat. *assidere,* to sit, from *ad* + *sedere,* Gk. ἕζεσθαι, *hezesthai,* Skt. *sad,* to sit; confused by popular etymology with Lat. *excisus,* p.p. of *excidere,* to cut off). The name of a tax on commodities. A tax on commodities bought and sold is a very obvious one, but it has generally appeared in the simple shape of a toll on goods brought to market, and the complicated arrangements for officially watching the process of a manufacture for the purpose of seeing that none of the dues of the revenues are evaded is of comparatively modern origin. Though a tax corresponding to the excise appears to have been occasionally levied in England in very early times, the name first appears in the act of the Long Parliament establishing an excise on liquors, in 1643, with the promise of repeal at the end of the war. But when the land tax was removed or greatly diminished, and revenue from that source was no longer sufficient, it was found impossible to dispense with this new method of supply to the treasury. Though always unpopular, the excise in some form or other has ever continued to be a material element in the taxation of Great Britain.

In the United States the term excise is comparatively unfamiliar. The taxation which corresponds to the English excise is here known as internal revenue taxation. See INTERNAL REVENUE.

An excise, when compared with other taxes, has its good and its bad features; it is a method of extracting money for national purposes as expenditures on luxuries, and is especially serviceable when fed from those luxuries the use of which in excess becomes a vice. On the other hand, it renders necessary a system of inquisitional inspection, while the manufacturer is at times obliged to employ a more expensive and inconvenient process, and to forego the introduction of improvements, in order to conform to governmental regulations, the cost of such unnecessary labor falling eventually upon the consumer. Moreover, checking the demand by artificially raising the price of a commodity in this way may often retard the growth of a rising industry. Though counteracted in a measure by the bonding system, the necessity of a larger capital for the manufacture of excisable articles fosters a sort of monopoly by its tendency to check competition; and since the manufacturer must realize profits on that part of his capital which is applied to the payment of taxes, as well as what is directly employed in the production of the article, the price to the consumer is greatly increased. These objections do not, however, invalidate the advantages of the excise system in this country, where the luxuries, spirits and tobacco, bear the chief burden of the tax; and it is the common opinion that a low excise on articles of luxury is the most productive as well as the least objectionable of taxes. See FINANCE; STAMP ACT; STAMPS; TAX.

EXCI′TANT (from Lat. *excitare*, to excite, from *ex*, out + *ciere*, to call), or STIMULANT (from Lat. *stimulare*, to stimulate, from *stimulus*, goad). Any pharmaceutical preparation which, acting through the nervous system, tends to increase the action of the heart and other organs. Excitants all possess more or less of a pungent taste, and give rise to a sensation of warmth when placed on a tender part of the skin. The class is a very numerous one, and the application of excitants or stimulants to the human subject should always be under the supervision of a qualified medical practitioner.

EXCITO-MOTOR ACTION. See NERVOUS SYSTEM.

EXCLUDED MIDDLE, THE LAW OF THE. The logical principle that, of two contradictory propositions, both cannot be denied. One of the two must be affirmed.

EXCLUSION BILL. See CHARLES II.; JAMES II.

EXCOMMUNICATION. Exclusion by formal sentence from the fellowship of the Christian Church. The ancient Romans had something analogous in the exclusion from the temples and from participation in the sacrifices of certain persons, who were given over with awe-inspiring ceremonies to the furies. The Mosaic law decreed excommunication in the case of certain offenses, and the intimate connection of things civil and ecclesiastical under the Jewish polity rendered it a dreaded punishment. In the time of Christ it was a recognized penalty in practice (see John ix. 22; xii. 42; xvi. 2). A distinction is drawn in the Mishna between two degrees of excommunication; of these, the milder (*cherem*) involved exclusion from the life of the community for thirty days, with the performance of penances and the wearing of mourning apparel. Twenty-four causes are enumerated, most of them of a civil nature, which justified this form of penalty. The heavier sentence (*niddui*) was pronounced with great formality of solemn curses, and was for an indefinite time. Little is definitely known about the possibility and the manner of reconciliation. Some have thought they found a third species of excommunication in the expression *shammatha;* but this is properly a general term, which may be applied to either of the foregoing. A similar power was recognized from the first in the Christian Church (see Matt. xviii. 17; I. Cor. v. 5; I. Tim. i. 20). Further proofs that it has always claimed the power of excommunication are to be found in such early writers as Irenæus, Cyprian, Basil, Leo the Great, and Ambrose. The fathers spoke of two forms of excommunication, medicinal and mortal—that is, healing or reformatory and damnatory. The two degrees of excommunication, major and minor, were early distinguished. Minor excommunication involved exclusion from the sacrament of the Lord's Supper and from other privileges of the Church. Major excommunication was pronounced upon obstinate sinners, relapsed offenders, and heretics. Its form was usually more solemn and the decree not so easily revoked. The term of the excommunication was left to the bishop. (See ABSOLUTION.) In Africa and Spain the absolution of lapsed persons—that is, those who in times of persecution had yielded and fallen away from their Christian professions by actual sacrifice to idols—was forbidden except at the hour of death, unless by the special intercession of martyrs. At first no civil disabilities were connected with excommunication, but as governments became Christian, major excommunication was followed by loss of political rights and exclusion from public office. The capitularies of Pepin the Short, in the eighth century, ordained that major excommunication should be followed by banishment. Other national laws still further extended the scope of the ecclesiastical censure. By a logical consequence a sentence of excommunication directed against the ruler deprived him of his rights to govern, and by that fact absolved his subjects from their allegiance to him. When such a purpose was intended, however, a special sentence to that effect was attached to the bull of excommunication. The reformers claimed the power of excommunication in the same degree as the Church from which they seceded. Luther, as may be seen from the *Table Talk*, insisted on the right of excommunication as inherent in the ministers of the Church. Calvin (see Dyer, *Life of Calvin*, London, 1850) asserted that excommunication is of the very essence of the ministry. At first civil disabilities, as in Geneva, followed excommunication in reform communities. Later this ceased to be the practice. Nevertheless in England, until 1813, persons excommunicated were debarred from bringing or maintaining actions, from serving as jurymen, from appearing as witnesses in any cause, and from practicing as attorneys in any of the courts of the realm. All these disabilities were removed by statute (53d Geo. III., ch. 127), and the excommunicate were declared no longer liable to any penalty, except "such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct." By the laws of the United States, excommunication cannot be made to involve the loss of civil rights, and the civil courts cannot be used to enforce the restoration of church membership.

Anathema differs from excommunication only inasmuch as it includes certain formal ceremonies, and requires a solemn reconciliation. There was some doubt on this point until the definition of the Council of Trent. The power of excommunication belongs to those who possess ordinary or delegated jurisdiction in the external forum, but only in regard to those subject to them. Parish priests who have jurisdiction only in the *forum internum* cannot excommunicate, and the power can never be delegated to laymen. Bishops, within their sees; archbishops, while exercising visitatorial jurisdiction; heads of religious orders, within their own communities, all possess the power to issue excommunication. The subjects of excommunication can be only Christians, alive and of sound mind, guilty of a grave offense and persisting in it, and subjects of the judge giving sentence. Neither Jews, nor pagans, nor the unbaptized heathen, nor the dead, can be excommunicated. The supposed excommunication of the dead was merely a declaration that the deceased had, *while living*, been guilty of some crime to which *excommunication is attached by the Church laws.* The sentence of excommunication may be justly inflicted on heretics or schismatics. Excommunication may be incurred without the necessity of formal sentence; this is an important distinction. For some acts a person may be excommunicated, but does not actually incur the sentence unless it is pronounced by a competent judge. For other faults, however, the words of the law are that upon a given act being done the doer of it falls at once under the ban of the Church, the phrase usually employed being "Let him incur excommunication *ipso facto.*" These are the excommunications *latæ sententiæ,* so called. Absolution from certain excommunications is reserved to the Pope. There are certain regulations with regard to intercourse on the part of the faithful with individuals who have been excommunicated. Those under major excommunication fall into two classes—the tolerated, whom the faithful are not bound to avoid, and the non-tolerated—that is, those excommunicated by name and publicly denounced — with whom the faithful are forbidden to hold either religious or civil communication. The latest Papal deliverance on this subject is the Bull *Apostolicæ Sedis,* issued by Pius IX., October 12, 1869. This permits civil intercourse, even with persons under major excommunication, for the sake of the faithful themselves, unless in very exceptional circumstances and with regard to specially designated persons. The formula of excommunication from the anonymous appendix to Marculphus cited in *Tristram Shandy,* and often quoted as the actual formula employed by Roman Catholic authorities, is a forgery and has never been employed. Consult: von Kober, *Der Kirchenbann* (Tübingen, 1857); Schilling, *Der Kirchenbann nach canonischen Recht* (Leipzig, 1859).

EXCRETION (Fr. *excrétion,* from Lat. *excernere,* to separate, from *ex,* away + *cernere,* to separate). In plants, the processes by which materials of no further use in nutrition are separated from the protoplasm and gotten rid of by the body. These processes are fundamentally the same as those of secretion (q.v.).

EXCRETION. See FÆCES; URINE; SWEAT; SECRETION.

EXCRE'TORY SYSTEM, COMPARATIVE ANATOMY OF THE. The organs whose function it is to remove from the animal body both the waste products of metabolism and the excess of other substances that occur in the blood. Not only are the products resulting from the metabolism of proteids separated from the blood, but the blood is kept at its normal standard by the excreting organs. They remove both the qualitative and quantitative excess of any substance in the blood. The excretory organs may be likened to discriminating strainers. Of two substances equally soluble in the blood, such as sugar and urea, the urea is extruded by them and the sugar retained, while such insoluble substances as resin are removed by the vertebrate kidneys. The excretory organs of vertebrates are primarily the kidneys. The skin and lungs likewise function to some extent as eliminating organs. The lungs, however, are both organs of nutrition and excretion, for while they take in oxygen, so necessary for the animal welfare, they throw out carbonic-acid gas, which is a poison to the animal body, and free the body from other excrementitious substances. The whole surface of the skin functions to some extent as an excreting organ, for considerable water, salts, and fats are expelled by the skin. The waste products produced by the breaking down of nitrogenous substances, and which contain nitrogen, such as uric acid and urea, are separated from the blood and discharged from the body by another set of organs, known as the renal organs or kidneys. These organs vary greatly in form and function throughout the animal kingdom.

PROTOZOA. The simplest excretory organ is the contractile vacuole found in the Protozoa, but little is known concerning its function. In certain Infusoria fine lines or spaces radiate out from the central part of the vacuole into the substance of the organism, and through them the waste substances are drained into the vacuole. The contents of the vacuole either burst to the exterior or are cast out forcibly through the body-wall by the contraction of the walls of the vacuole.

FLATWORMS. Organs that have an undoubted excretory function are first met with in the flatworms (Platyhelminthes). They are known as the water-vascular system. This system consists, in Planaria, of two lateral coiled trunks, one on the right and one on the left side of the body, from which many side branches ramify through the tissues of the body. These tubes open on the dorsal surface of the body by means of several minute pores. The fine lateral branches subdivide so as to give rise to still finer capillary vessels. Each of these latter may terminate in a flame-cell. The flame-cell is nucleated, and contains a vacuole or space in communication with a capillary. The vacuole contains one or more vibratile cilia, whose flickering motion, like that of a candle-flame, has given rise to the term flame-cell. A respiratory function has also been maintained for this system. The excretory system of the liver-fluke consists of one main trunk, which terminates anteriorly in four large, branching trunks. The latter eventually lead into flame-cells. Posteriorly the main trunk ends in an excretory pore. In the tapeworm there are four longitudinal water-tubes, which extend throughout the entire length of the worm. At the posterior end of each proglottis they are connected by a transverse tube. At the posterior end there is a pulsating caudal vesicle which opens to the exterior. As in the planarian, so in the tapeworm the main trunk gives rise to dendritic branches which end in flame-cells. The lateral tubes of nematodes and rotifers end in a common duct or a contractile vessel, respectively, posteriorly, and in flame-cells at the other end.

ECHINODERMATA. It is maintained by some authorities that the water-vascular system of Echinodermata helps to get rid of waste products. (See ECHINODERMATA.) The real function of this system is little understood. It probably subserves more than one function.

BRACHIOPODA. In the brachiopods there is a pair of nephridia lateral to the intestine. Each is funnel-shaped, and opens into the body-cavity by means of a plaited nephrostome and outwardly into the mantle-cavity by means of a narrow curved portion.

ANNULATA. The organs that are considered to be excretory in the segmented worms are known as the segmental organs or nephridia. They consist of a pair of tubes which are repeated in most of the annelids in nearly every segment of the body. There is only one such pair of tubules in Sipunculus, and in some other worms they are not found in a few of the most anterior and posterior segments of the body. A nephridium consists of a long tube coiled in a complicated manner. Each tube ends anteriorly in a ciliated funnel. The funnel connects with the cœlom or body-cavity of the segment just anterior to the one in which its coiled tubule lies and in which the tubule communicates with the exterior by a ventral, contractile opening. In the earthworm a part of the lumen of the tubule is intracellular, like the flame-cells of Scolecida; that is to say, it is formed by the perforation of a strand of cells. The thicker portion of the tubule is lined with cells, hence this portion of the lumen is intercellular.

CRUSTACEA. The excretory system of Crustacea shows little relationship either with that of annulates or with insects. In larval Crustacea two sorts of so-called excretory organs are present. One pair of these organs lies at the base of the antennæ, and are known as the antennary glands—the 'green gland' of the crayfish. The other pair comprise the so-called 'shell-glands' which open at the base of the second maxillæ. In the course of the development of the Crustacea one pair atrophies. The Entomostraca retain the shell-gland, and the Malacostraca the antennary gland. In the Stomatopoda, of which Squilla is an example, the renal excretion is poured through a pair of glandular tubes into the rectum. In the amphipods the excretory function is assigned to the cœca at the posterior end of the mesenteron. The shell-gland of some of the Cirripedia is said to open like a true nephridium into the body-cavity.

Peripatus possesses paired nephridia much like those of annulates. They open at the basal and lower surface of the legs. The fringed funnel of each nephridium opens either into the body-cavity or into a closed sac. The development of the salivary glands, anal glands, and reproductive ducts shows that they are modified nephridia.

HEXAPODA. The excretory system of insects is well developed, but bears no relation to that of annulates. There are no nephridia, but in connection with the proctodæum (hind gut) there are from two (some Lepidoptera) to one hundred and fifty (bee) fine tubes or solid threads, the Malpighian tubes, which twine about in the abdominal cavity. To these organs has been ascribed the excretory function, since uric acid is contained within them. In the Orthoptera these tubules may be united with a common duct.

MOLLUSCA. A pair of kidneys or excretory organs are always present in the Mollusca. In many forms they are symmetrically arranged, one in each half of the body. These organs communicate with the body-cavity by means of a wide opening (frequently a ciliated funnel), and with the exterior by means of a small opening. In these respects they correspond with the annelidan segmental organs and probably they are homologous with a pair of such organs. These mesonephridia are situated just below the pericardium, with which the kidney portion of the organ also communicates. Besides the glandular kidney part there is usually a ciliated bladder portion. The cilia create an outward-flowing current. The molluscan kidney is known as the organ of Bojanus, in honor of its discoverer. In addition, there is a gland known as Weber's organ, which lies in front of the pericardium. It discharges its secretion into the pericardium, and is considered to have an excretory function. The nephridia of gastropods open directly to the exterior or by a ureter near the anus. The right organ is the larger, or in some cases is the only one to be developed. In the pearly nautilus there are four renal organs. In the squid and nautilus the glandular portion of the kidney follows along the right and left branchial veins.

CHORDATA. Balanoglossus has a very slightly developed excretory system. Two ciliated funnels pass to the exterior in the region of the collar, but no nephridia are known. The proboscis gland has been thought possibly to have an excretory function, but apparently it does not open to the exterior. In tunicates the excretory function has been ascribed to a mass of clear vesicles in the loop of the intestine. In them uric acid is present. The so-called sub-neural gland may possibly also have secretory function. In Amphioxus Boveri has discovered about ninety pairs of nephridia. They are short tubes, and open into the atrial cavity by a single opening for each tubule. The other end is in communication with the body-cavity by means of a variable number of funnels. Ray Lankester, Hatcheck, and others have described other tubules in different regions of the adult or larva whose function is in doubt. Likewise on the floor of the atrial chamber there are groups of cells which have been called renal papillæ.

CRANIATA. The urinary system of vertebrates is so intimately connected with the reproductive system that the two systems are frequently considered together under the title *urinogenital system* or *organs*.

The excretory organs of vertebrates are much more complicated than any we have so far considered. In its most highly developed form the vertebrate excretory system consists of three sets of organs. The first set to arise, both in phylogenetic and ontogenetic development, are known as the *promephos* or 'head kidneys.' Usually they arise in a more anterior position than the other kidneys. In position as well as in several other respects they correspond to the segmental tubules of amphioxus. They are segmentally arranged like those of amphioxus and annulates, but they are much fewer in numbers. They arise in the mesoderm of the anterior end of the cœlomic wall and each tubule opens into the cœlom by a ciliated funnel. They differ from the tubules of annulates and amphioxus, however, in that each tubule does not open directly to the exterior, but pours its secretion into a common duct—the *segmental duct*—which in turn discharges into the cloaca. It has been suggested that the segmental tubules formerly poured their contents into a longitudinal groove situated on the exterior. By the sinking of the groove beneath the surface a tube was formed. The embryonic development of this duct gives little light as to its origin. In some cases it is formed by a growth backward from the pronephros. In others the mesoblast or even the hypoblast seems to take an active part in its formation. The head kidney is said to be the functional excretory organ in the fish Teirasfer and some of the other bony fishes. In Myxine and Bdellostoma it persists throughout adult life, although evidently in a somewhat degenerate condition; while in all the higher vertebrates except turtles and crocodiles it is rudimentary even in embryonic life.

The head kidney then is present at some stage in the development of all vertebrates, although its appearance may be very fleeting in some forms, and it may be so rudimentary in others as never to be functional. When the head kidney is functional the *mesonephros* or 'middle kidney' appears later in larval development than in the cases in which the pronephros is only rudimentarily developed. The mesonephros consists of another series of tubules, developed from the mesoblast and usually in a position posterior to that of the head kidneys. These tubules likewise become connected with the segmental duct. Below the Amniota this, the Wolffian body, is the permanent kidney. Upon the appearance of the mesonephros the nephridia of the head kidneys lose their connection with the segmental duct. The tubules of the mesonephros also open into the body-cavity by ciliated funnels. The funnels are not always present. They are in intimate relation with a glomerulus from the aorta. In selachians, Paul Meyer and Rückert have observed vessels which connect the dorsal aorta with the subintestinal veins. Such a blood-supply corresponds more nearly with that afforded by the segmental organs of the amphioxus.

In many forms the segmental duct seems to divide, or at least two ducts appear side by side. One retains its connections with the kidney tubules and is known as the Wolffian duct. The other, the Müllerian duct, opens into the body-cavity on the one hand and as the oviduct serves to convey the eggs to the exterior. In the male the Wolffian duct becomes the genital duct. In the higher vertebrates still a third or permanent kidney arises posterior to the mesonephros, and is known as the metanephros. This is the 'kidney' of the higher vertebrates. The permanent kidney consists of coiled tubules, but a nephrostome is never present. Capillaries, forming glomeruli, are also present. The duct, the ureter of the permanent kidneys of higher vertebrates (from reptiles to man), is formed from a diverticulum which grows forward from the posterior end of the Wolffian duct and connects with the posterior nephridia.

The urinary bladder of fishes is formed by a diverticulum of the ureter. In higher vertebrates the bladder, while it has the same function, has an entirely different origin from that of fishes, for it arises as a pouch on the ventral wall of the cloaca.

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EXCURSION, The. A didactic and descriptive poem in blank verse, by Wordsworth, originally intended as a part of *The Recluse*, never completed. It appeared in 1814, and aroused a violent controversy between the critics of the old and the new order.

EXE, ĕks. A river rising in Exmoor, in West Somersetshire, England (Map: England, C 5). It flows 19 miles southeast to the borders of Devonshire, and then 35 miles south through that county, past Tiverton and Exeter, into the English Channel at Exmouth.

EXECUTION (Lat. *executio*, performance, from *exequi*, *exsequi*, to carry out, from *ex*, out + *sequi*, to follow; connected with Gk. **ἕπεσθαι**, *hepesthai*, Lith. *sekti*, Skt. *sac*, Av. *hac*, to follow, Goth. *saíkwan*, Icel. *sjā*, OHG. *sehan*, Ger. *sehen*, AS. *sēon*, Eng. *see*). The enforcement, by the duly constituted authorities, of a final judgment, order, or decree of a court of justice. In strictness, the term has reference only to the enforcement of the process of the common-law courts, whether in civil or in criminal cases, and is not applicable to the procedure for carrying into effect the decrees of the equity courts. This is due to the radical difference in the jurisdiction exercised by the two classes of tribunals. A judgment in a court of law is merely an adjudication of the rights of the contending parties, declaring that one is or is not entitled to specific property or to a sum of money. In itself considered it has no further force, and is ineffectual until enforced by distinct process, and this is furnished by the writ of execution, addressed to the administrative officers of the county, and by the proceedings taken thereunder. A court of equity, on the other hand, acts *in personam;* that is, its decree is directed to the person against whom the proceeding is brought and binds him directly without further process. The machinery of the court is sufficient to enforce its decrees without calling upon the administrative officers of the county or the State to carry them into effect. However, in those cases in which the decree in equity directs the delivery of specific property or the payment of a sum of money, the process of execution is coming to be employed for carrying it into effect.

Execution on civil process is generally accomplished by the seizure of the judgment debtor's property or person. In England, the subject is now regulated almost entirely by the rules of the Supreme Court. These declare that the term 'writ of execution' shall include the common-law writs of fieri facias, capias, elegit, sequestration, and attachment (qq.v.); and they provide for the form as well as for the manner of issuing and enforcing each of these writs.

In this country, the form of executions and the method of issuing and enforcing them are quite various. The statutes and court rules of each State must be consulted for the procedure therein, and the Federal statutes and court rules for the procedure in Federal jurisdictions. In general terms it may be said that, a final judgment having been rendered, the attorney for the judgment creditor is authorized to issue a writ of execution to the sheriff, marshal, or similar administrative officer, commanding him to seize and sell property of the judgment debtor sufficient to pay the judgment with interest as well as the officer's fees and expenses. In certain cases, usually those where the judgment debtor has been guilty of some fraud or violence or other misconduct, an execution may be issued against his body, commanding the officer to seize and imprison him until the judgment is paid. This is commonly known as a 'body execution.' Certain property of the judgment debtor is exempted by statute from execution. This includes, as a rule, a small amount of household furniture, of food and fuel for his family, of wearing apparel, of books, tools, and implements of trade, and the like. Here, again, the statutes applicable to a particular case must be consulted. Consult: Edwards, *Law of Executions* (London, 1888); Freeman, *Treatise on the Law of Executions in Civil Cases* (3d ed., San Francisco, 1900). See DEBTOR.

Execution in criminal cases is the enforcement of a sentence or judgment duly pronounced by a court. If the judgment is for other than *capital punishment* (q.v.), a certified copy of its entry upon the minutes of the court is generally required to be furnished to the officer whose duty it is to enforce it, and no other warrant or evidence of authority is necessary to justify its execution. If the criminal is sentenced to the punishment of death, a warrant, signed by the judge presiding at the trial, is ordinarily delivered to the sheriff or similar officer, appointing the time and describing the manner of the execution. Formerly, criminal sentences were executed publicly, and often were revolting exhibitions of cruelty. The modern tendency throughout Christendom has been to abolish the publicity and to minimize the cruelty of criminal executions. Consult the authorities referred to under the titles CRIMINAL LAW; SHERIFF; CAPITAL PUNISHMENT, etc. See PUNISHMENT; CAPITAL PUNISHMENT; DROWNING; ELECTROCUTION; GUILLOTINE; HANGING; MAIDEN; MURDER; NEWGATE; PARRICIDE; PEINE FORTE ET DURE; TREASON; TYBURN; WHEEL, BREAKING ON THE, etc.

EXECUTION, MILITARY. See MILITARY LAW.

EXECUTIONER. The official who inflicts capital punishment. In early times, both among the Romans and the Teutonic peoples, a distinction was made between two aspects of the function. In Rome the lictors executed sentences passed on citizens, while an official called *carnifex,* whose office was considered degrading, crucified or tortured slaves and foreigners. In primitive Germany the carrying out of the sentence usually fell either to the community from which it proceeded or to the accuser and his friends—a custom which in some places prevailed as late as the sixteenth century, although the counts of the Frankish monarchy had their official jailers and hangmen. Sometimes the youngest bailiff, or the youngest married man, was bound to carry out the sentence; in other cases one of the criminals was allowed to purchase his freedom by acting as executioner. In the towns sentence of death was usually executed by a subordinate official. In times of more definite organization another distinction was made between the *Scharfrichter,* who beheaded the victim without the necessity of personal contact, and the *Henker,* usually his subordinate, who carried out sentences of hanging, burning, quartering, and torture. The office of the former was expressly declared by law to imply no degradation, but popular feeling turned with disgust from it, and required its bearer to occupy a designated place in church and to present himself last of all for communion.

Like many other offices, that of executioner seems to have been at one time hereditary in England, as in several German States, certain families being thus, as it were, condemned to perpetual infamy. In some parts of England the office was annexed to other posts; thus the porter of the city of Canterbury was executioner for the county of Kent in the time of Henry II. and Henry III., for which he had an allowance of twenty shillings a year from the sheriff, who was reimbursed by the exchequer. The sum of thirteen pence halfpenny was long popularly spoken of as 'hangman's wages,' such a sum, equivalent to a merk Scots, having been the fee for each performance.

From Gregory Brandon, the London executioner in the reign of James I., the name Gregory was employed as a familiar designation for the profession in general. Brandon managed to procure from the Heralds' College a coat armorial, and became an esquire by virtue of his office. One of his successors, Dun, is referred to in Butler's *Ghost,* published in 1682:

> For you yourself to act 'Squire Dun,'
> Such ignominy ne'er saw the sun.

He was succeeded by John or Jack Ketch, commemorated by Dryden (*Epilogue to the Duke of Guise*), and his name has since been synonymous with hangman. All parts of England have in recent times depended upon the London executioner for the actual hanging. Calcraft and Marwood have been the best-known holders of the office in modern days. The Parisian executioner is familiarly styled 'Monsieur de Paris.' The Sanson family have been the most distinguished bearers of this title. (See *Memoirs of the Sansons,* London, 1875.) It was one of this family who officiated at the execution of Louis XVI.

In all the American States a provision is made for such an official, but the title and duties differ in each. In many of the States the sheriff is the executioner in his particular county; but in large States like New York, where a State prison exists, the warden of that institution is technically, not practically, the executioner. In the

United States Army the provost-marshal performs the duties of military executioner.

EXECUTIVE DEPARTMENT. The branch of government to which is confided the duty of executing the laws; in distinction from the legislative department, which enacts, and the judicial department, which interprets them. In the United States Government, the chief executive officer is the President; in the several States, the Governor. The secretaries of State, Treasury, Interior, Agriculture, War, and the Navy, with the Postmaster-General and the Attorney-General, are officers of the executive department under direction of the President. The Constitution does not recognize their existence, but custom has made them his counselors and advisers. In the different departments are numerous subordinate executive officers, known as assistant secretaries, clerks, examiners, solicitors, auditors, controllers, commissioners, deputy commissioners, directors, chiefs, superintendents, etc. There are also collectors of internal revenue (in districts), and collectors and surveyors of customs (in districts).

EXECUTIVE OFFICER, United States Navy. An officer of a naval vessel detailed by the Secretary of the Navy from those line officers who are not by law restricted to the performance of engineering duties. He is usually the line officer next in rank to the captain, and acts as his aid in carrying on the business of the ship, being responsible for the proper organization of the ship's company, although he possesses no independent authority. He acts as recruiting officer and has charge of the ship's records, being assisted by one or more *writers* as clerks. He is the equipment officer of the ship, in which duty he is assisted by the boatswain and has a *yeoman*, or clerk, for keeping the accounts. He is also construction officer, and has charge of the hull, boats, and other construction matters, and in this department he is assisted by the carpenter. He is 'on duty' at all times, and has general supervision over all matters connected with the organization, police, inspection, discipline, exercise, and official condition of the crew, and the cleanliness, good order, efficiency, and neat and trim appearance of the ship. When all hands are called for the purpose of carrying on general evolutions, he has charge of the deck. In battle he has general supervision of the battery, and of all matters pertaining to the safety and efficiency of the ship.

EXECUTOR (Lat., performer, accomplisher). The personal representative of a decedent, appointed by last will and testament. His functions are to-day substantially those of an administrator, and are limited to the administration of the personal estate of the testator. By the ecclesiastical law of England, however, by which his powers and duties were formerly regulated, his position was one of much greater consideration. There he was regarded much in the light of the heir (*hœres*) of the Roman law (from which the ecclesiastical law was mainly derived), and as the owner of the personal property left by the decedent. His duty was originally confined to the discharge of the funeral expenses and the debts of his testator, and, later, of the personal legacies bequeathed by the will, the residue in his hands belonging to him absolutely. The right, universally recognized to-day, of the next of kin of the decedent to share the residuum of the personal estate among them, after payment of debts and legacies, is wholly due to a series of statutes, which have gradually reduced the executor to the position of an administrator.

As the expression 'personal representative' indicates, the executor is entitled only to the personal rights of his testator, and not to those in our law denominated real; that is to say, only the personal property and personal rights of action—as on contract, for debts due, etc.—accrue to him, while real property and rights of entry and actions for the recovery of freehold estates in land descend to the heir. Where, as is frequently the case, the executor is authorized by the will to sell real estate for the payment of debts, he does not thereby acquire any title therein, but only a power of appointment or sale. (See Power.) The proceeds of such sale become equitable assets (q.v.) in his hands.

In this respect his position has always been different from that of the Roman *hœres*, who succeeded to the entire estate of his testator. Like the *hœres*, however, and unlike the English and American administrator, the title of the executor to the personal estate of the decedent vests at once upon the latter's death, and is not dependent upon the probate of the will under which he claims, nor the issue of letters testamentary. It is only for the purpose of enabling him to maintain suits at law and as conclusive evidence of his authority, that probate proceedings are necessary. It should be added that while the restriction of the executor's estate and authority to the personal property of his testator is still generally observed, a few American States have by statute invested him with similar jurisdiction over the real estate, and that a similar change has recently been effected in the English law by the Land Transfer Act, 1897 (60 and 61 Vict., c. 65).

The duties of an executor are now usually prescribed by statute, and may be briefly summarized as follows: *First.* To bury the decedent in a manner suitable to the estate. *Second.* To prove the will and take out letters testamentary. *Third.* To move and file with the probate court an inventory of the personal estate. *Fourth.* To collect the goods and chattels of the testator, and his claims against others, with reasonable diligence. *Fifth.* To advertise for claims against the estate. *Sixth.* To pay the debts in the order of priority established by law. *Seventh.* To distribute the chattels and pay the legacies in accordance with the terms of the will. *Eighth.* To convert the surplus of personal estate, if any, into cash, and distribute it among the next of kin, according to the statutes of distribution. *Ninth.* To keep the money and other property of the estate safely and prudently. *Tenth.* To render an account whenever called upon by proper authority so to do, and to apply for a discharge upon a final accounting, within the time prescribed by statute for the completion of the administration.

Generally speaking, any one who is not mentally incompetent may be an executor; even infants, and married women under the common-law disability of coverture (q.v.). The court may compel an insolvent or non-resident executor to give security; but ordinarily an executor need not give security, unless (as is the case in some American States) he is required by statute so to do. No one is compelled to accept the office of executor against his will; but, having once been accepted, the duty cannot be renounced nor assigned to another, and the acceptance may be informal and even unintentional, as by taking possession of the estate, paying the executor's own claim out of money of the testator in his hands, etc.

Executor de Son Tort. A person not named in the will as executor may, by usurping the office, have its liabilities and many of its powers imposed upon him, without thereby acquiring its privileges and immunities. Such a person is known as an executor of his own wrong (*de son tort*). Any assumption of authority over the estate, or any interference with it, such as belongs of right to an executor, constitutes such a usurpation. An executor *de son tort* is liable only for such assets as come into his hands, and the acts of *de facto* administration performed by him are in general valid so far as other parties who deal with him in good faith are concerned.

In the law of Scotland the term executors is employed to describe the next of kin of a decedent, whether testate or intestate, who are entitled to share in the distribution of his personal estate, the person corresponding to the executor of English and American law being distinguished by the title of testamentary executor. (See Administration; Distribution; Heir; Personal Representative; Will.) Consult: Wentworth, *Office and Duty of Executors* (London, 1728; Amer. ed. Philadelphia, 1832); Burn, *Ecclesiastical Law* (30th ed., London, 1869); Williams, *The Law of Executors and Administrators* (9th ed., London, 1893); Croswell, *The Law Relating to Executors and Administrators* (Boston, 1889); Woerner, *The American Law of Administration* (2d ed., Boston, 1902).

EXECUTORY DEVISE. A testamentary gift of a future interest in real or personal property of such a nature that it cannot be brought within the technical description of a remainder. In its earlier period the common law recognized no future estates in personal property, nor any in real property but reversions and remainders. Both of these were the remnants of a freehold out of which a smaller estate had been 'carved,' as the expression was, and given to another. If this remnant was retained by the former freehold tenant, it was a *reversion;* if it was, at the time of the creation of the lesser estate, given to a third person, it was a *remainder.* Thus, if a tenant in fee simple made a conveyance of a life estate, he still had a fee simple which was conceived of as reverting to him at the expiration of the life estate, or which he might vest in another as a remainder. In either case the future estate, to be valid, must fit exactly upon the precedent estate. An interval of even a day between the two rendered the attempted future estate void. Neither could there be a remainder to take effect in the future without a preceding estate 'to support it,' nor could a remainder be created after or in derogation of a fee simple.

The practice of conveying lands to the use, or in trust for others, which prevailed in England during the fifteenth and sixteenth centuries, opened the way for the recognition of certain future interests in land which were not permitted by the rigid and artificial common-law system, and the famous Statute of Uses, passed in the twenty-seventh year of Henry VIII. (1535), stereotyped these interests into new legal estates, known as *springing* and *shifting uses.* The Statute of Wills (32 Hen. VIII.), which for the first time permitted the free alienation of lands by will, enabled testators to create the same interests more simply and directly by testament, under the description of executory devises. These were of two classes, corresponding to the shifting and springing uses, the former including future estates to take effect in substitution for a preceding fee simple—as a gift of land to A and his heirs, the same to go to a charity if A or his heirs ever ceased to occupy the premises so given; the second comprehending future interests to arise on an uncertain event—as a devise to B when he should attain the age of twenty-one years. In the form here described, executory devises have continued to be a recognized form of testamentary disposition of real estate, and the expression has also been extended by analogy to include certain future interests in personal property which have acquired legal recognition.

This form of limitation is restrained by the law against perpetuities (q.v.), which requires that the estate must take effect within a life or lives in being and twenty-one years after. The law will not interpret a limitation as an executory devise if it can be otherwise sustained. Whenever, therefore, a future interest in land is so devised as to fall within the rules laid down for the limitation of contingent remainders, such devise will be construed as a contingent remainder, and not as an executory devise. An executory devise, unlike a remainder, cannot be defeated by any act of the first taker or devisee; when, therefore, an absolute power of disposition is in the first taker, the limitation over is not an executory devise. See Devise; Future Estate; Remainder; Use.

EX'EGE'SIS (Neo-Lat., from Gk. *ἐξήγησις*, *exēgēsis*, explanation, from *ἐξηγεῖσθαι*, *exēgeisthai*, to explain, from *ἐξ*, *ex*, out + *ἡγεῖσθαι*, *hēgeisthai*, to lead, from *ἄγειν*, *agein*, to lead) OF THE BIBLE.

OF THE OLD TESTAMENT.

The Bible of the Apostolic Church was, naturally, the Scriptures of the Jews, and these Scriptures mainly in the Greek form of the Septuagint translation, since the popular ignorance of the Hebrew language at that time rendered direct use of the original text impossible. Concerning the interpretation of these Scriptures by the immediate disciples of Jesus, we have no certain information. It may be inferred, however, from such documents as we possess that their exegesis of the Law did not differ materially from that of the earlier rabbis in the Mishna, while their haggadic interpretation of the Prophets and the Psalms was such as to furnish them with proofs of the Messiahship of Jesus and with material for His life. This attitude was largely preserved, even beyond the middle of the second century, in the Ebionitish circles, whence the Clementine writings proceeded. But the identity of Judaism and Christianity could be maintained only at the sacrifice of certain parts of the Law that were declared unprophetical, and therefore un-Mosaic. In this connection, observations of style are introduced in which the beginnings of literary criticism may be discerned. A fresh impulse in the direction of an allegorizing exegesis was given by Gnosticism. When men like Valentinus and his disciples, Ptolemy and Heracleon, Basilides and Isidore, Saturninus and Carpocrates, Marcion and Tatian embraced Christianity, it was impossible for them to be satisfied with even the most liberal attitude of the Christian Jew. No synagogue training prevented them from measuring 'the God of the Jews' by the standard furnished by the Christian revelation, and the commandments of the Law by standards of Christian worship and morals. An effective defense of the Catholic side could only be made by the chastened Gnosticism and allegorizing interpretation that meet us in Hebrews, Barnabas, Colossians, Ephesians, the Pastorals, and the Fourth Gospel. The same method and speculation were characteristic of Justin (died c.166), Pantænus (died c.190), Clement of Alexandria (died c.215), and Origen (died c.254). As a textual critic and as a thinker, Origen easily holds the foremost place among the early fathers, though his knowledge of Hebrew was inferior to that of Jerome. His allegorical method was followed by Dionysius (died 265), and Gregory Thaumaturgus (died c.270); and, to a large extent, by Eusebius (died c.340), Athanasius (died 373), the three Cappadocians, Basil (died 379), Gregory of Nyssa (died c.395), and Gregory of Nazianzus (died c.390); Ambrose of Milan (died 397), and Cyril of Alexandria (died 444). On the other hand, the foundations of a sound historico-grammatical interpretation were laid by the school of Antioch, whose chief representatives were Theodore of Heraclea (died 350), Eusebius of Emesa (died c.360), Diodorus of Tarsus (died 394), Chrysostom (died 407), Theodore of Mopsuestia (died 429), his brother Polychronius, and Theodoret of Cyrus (died c.457). Especially the criticism of Theodore of Mopsuestia was often very keen. Ephraem Syrus (died 378) also devoted himself particularly to a grammatical explanation of the text, and the school of Nisibis seems to have been comparatively free from allegorizing tendencies, as may be seen from the conception of the Bible which Junilius (died 552) declares that he has received from Paul the Persian. Through Jerome (died c.420) and Augustine (died 430), however, the interpretation that sought to discover a double or manifold sense became dominant in the Latin Church. Jerome possessed a deeper knowledge of Hebrew, acquired from Jewish teachers in Palestine, than any other patristic writer, and had great skill as a translator; while Augustine knew no Hebrew and little Greek, but often understood the meaning of the text better. Though he had neither the erudition of Jerome nor the genius of Augustine, Faustus of Mileve (born 344) was a greater critic than either, anticipating some important positions of modern scholarship.

In the sixth century commentators like Cassiodorus (died c.580) and Procopius of Gaza (died 520) began to give a conspectus of earlier interpretations in so-called 'chains' (*catenæ*, (σεῖραι), and Cosmas Indicopleustes (c.550) gave a summary of authorship, purpose, and contents of the biblical books. The learned Isidore of Seville (died 636), Bede (672-735), and Alcuin (died 804) largely epitomized Jerome. These excerpts from the fathers were much reduced in the *Glossa Ordinaria* of Walafrid Strabo (died 849), and by the learned Rabanus Maurus (died 856), who already seems to have given some attention to the Hebrew; also by Haymo of Halberstadt (died 853) and Remigius of Auxerre (died 890). With Johannes Scotus Erigena (died c.891) the allegorical interpretation covered many views in advance of his age, on the creation, the fall of man, the last things, and other subjects. Lanfranc (c.1005-89) continued Alcuin's labors for the purification of the Latin text. Anselm of Laon (died 1117), in his *Glossa Interlinearia*, Rupert of Deutz (died 1135), and Hugo of Saint Victor (died 1171) pursued the fourfold sense of Scripture, historical, allegorical, tropological, and anagogic; and even men like Thomas Aquinas (died 1274), Bonaventura (died 1274), and Albertus Magnus (died 1280) did not break with the prevailing method. But the teaching of Abélard (died 1142) and the Nominalists had a tendency to call the attention away from types and allegories, and Roger Bacon (died 1294) applied his method, not only in the study of natural objects, but also as a textual critic. In order to convert the Jews and Moslems, to dispute successfully with them, or even to expurgate their books, it became necessary to learn the Hebrew and Arabic languages. Seminaries where Hebrew and Arabic were taught began to be founded in the thirteenth century, and the Council of Vienne (1311) ordained that chairs of Hebrew, Arabic, and Aramaic should be established in Paris, Bologna, Oxford, and Salamanca. The results of this new impulse are seen in the *Pugio Fidei* of Raymond Martini (died 1296) and the *Postilla* of Nicolas of Lyra (died 1340). Both of these authors were familiar with Talmudic and Rabbinic writings, as well as with the Hebrew Bible, and especially the latter drew largely upon Solomon ben Isaac (Rashi).

The Renaissance brought an improved critical method, as well as increased knowledge of classical antiquity. Of great importance was the criticism of sacred texts and traditions by Lorenzo Valla (died 1457). Such Hebraists as Johann Wessel (died 1489), Pico della Mirandola (died 1494), Conrad Pellicanus (Kürschner, died 1556; his grammar appeared 1503), and Johann Reuchlin (died 1522) facilitated the philological study of the Bible. The exegesis of Franz Vatablus (Vatblé, died 1547), Santes Pagninus (died 1541), Johannes Maldonatus (died 1583), and Gilbert Génébrard (died 1597) was based on the Hebrew text as well as the Latin and Greek versions and sought to discover the literal sense. Even Titelmann (died 1530) and Cajetan (died 1534), who knew the original only through Latin translations, recognized its importance and discarded allegorizing. The learned lawyer Andreas Masius (Maes) in 1574 published an important commentary on Joshua, in which he maintained that the Pentateuch had been compiled by Ezra from documents of different ages. Great services were rendered to textual criticism by Ximines through his editions of the Bible in the Complutensian polyglot (1514-17); Arias Montanus, as editor of the Antwerp polyglot (1569-72); Pierre Morin and Antonio Caraffa, by editing the Sixtine edition of the Greek Bible (1587); and Robert Stephanus (Estienne) in preparing for the press the Latin Vulgate (1532).

Martin Luther (died 1546) broke in principle with the allegorical method, though his exegesis still shows its lingering fascination and is at times unduly influenced by dogmatic considerations. While he recognized the importance of the Greek and Latin versions, he leaned somewhat too confidently on the Massoretic text as the 'veritas Hebraica.' He opposed the authority of the Bible to that of the Church, yet in determining the canonicity and relative value of the books he depended largely upon his own subjective judgment. His German version is an admirable achievement and exercised a great influence on the interpretation of the Bible among Protestants. Philip Melanchthon (died 1560) and Johannes Brentius (Brenz, died 1570) possessed a good equipment for exegetical work. Ulrich Zwingli (died 1531) and Johannes Œcolampadius (Hausschein, died 1531) were also sober and capable exegetes. But easily the foremost interpreter of the Bible in the sixteenth century was John Calvin (died 1564). His knowledge of Hebrew may have been less than Luther's, but his exegesis is freer from irrelevant digressions, observes more keenly the connection of thought, and attempts to explain what needs explanation. Philologically the commentaries of Johannes Mercerus (Mercier, died 1570) are of great value. Less important are those of Theodore Beza (died 1605). Among the more radical interpreters of the time Andreas Bodenstein Carlstadt (died 1541), Johannes Denck (died 1529), Sebastian Castalio (Chateillon, died 1563), and Michael Servetus (died 1553) deserve to be mentioned. Carlstadt wrote discriminatingly on the canon, and his remarkably keen literary criticism led him to reject the Mosaic authorship of parts of the Pentateuch. Denck interpreted the Bible as an expression of the spirit that enlightens every man, and instead of Church or Bible, made the Christian consciousness the ultimate judge of truth. His translation of the prophets was valued and used both by Luther and in the Zurich Bible. Chateillon recognized the true character of Canticles and urged its exclusion from the canon. In editing Santes Pagninus's Latin translation, Servetus expressed in notes some very advanced ideas.

During the seventeenth century marked contributions to biblical interpretation were made by Catholic scholars, especially by members of the Society of Jesus and the Oratorians. Among the former, Bento Pereira, in 1600, and Jacques Bonfrère, in 1625, called attention to post-Mosaic material in the Pentateuch. Athanasius Kircher (died 1680) laid the foundations of our knowledge of Coptic and began to use it for the elucidation of the Bible. Cornelius a Lapide (van den Steen, died 1637) prepared a learned commentary on the whole Bible. Two fathers of the Oratory, Jean Morin (died 1659) and Richard Simon (1638-1712), rendered distinguished services to biblical science, the former chiefly by his Samaritan studies and his recognition of the late date of the vowel-points, the latter by his excellent critical history of the Old Testament (1678), in which he set forth the evidences against the Mosaic authorship of the Pentateuch. Of importance was also the publication by Michael le Jay of the Paris polyglot in 1629-45. The comments of Catholic interpreters such as Emmanuel de Sa (died 1596), Wilhelm Estius (died 1613), and Tirin (died 1636) were gathered together by Jean de la Haye in his *Biblia Magna* (1643) and *Biblia Maxima* (1660). Among the Protestants, Johannes Drusius (van den Driesche, died 1616); Johannes Piscator (Fischer, died 1626); Joseph Scaliger (died 1609), who first brought Israel's history into connection with the history of Semitic antiquity; Hugo Grotius (de Groot, died 1645), whose sober exegesis eliminated a mass of supposed Messianic prophecies; Louis de Dieu (died 1642); Johann Heinrich Hottinger (died 1667); Samuel Bochart (died 1669); Sebastian Schmidt (died 1696); and August Pfeiffer (died 1698) by their works contributed to the understanding of the Bible. The most learned Hebraists of the time were Johann Buxtorf (died 1629) and his son, Johann Buxtorf (died 1664). Their contention for the high age of the vowel-points influenced deeply theological thought. It is the chief merit of Louis Cappel (died 1658) that he upheld the truth, now universally recognized, against their error. In England Bryan Walton (died 1661), the editor of the London polyglot; the eminent Orientalists Edmund Castle (died 1685) and Edward Pocock (died 1691); John Pearson (died 1686), one of the editors of the great compilation *Critici Sacri* (1660); Matthew Poole (died 1679), editor of the *Synopsis Criticorum* (1669-76); John Selden (died 1654); John Lightfoot (died 1675), the student of rabbinic lore; John Spencer (died 1693), who first viewed Hebrew ritual in the light of the customs of other nations; Thomas Hobbes (died 1679), whose *Leviathan* (1651) paved the way for a more fruitful literary criticism; and Charles Blount (died 1693), who showed the disparity between the account of creation in Genesis and the facts discovered by science—all rendered service in biblical interpretation.

Possibly the most important contributions of Catholic scholars in the eighteenth century were made by Charles François Houbigant (died 1783), whose Latin translation was made for the first time throughout from a Hebrew text, amended by conjectural criticism (1753); Jean Astruc (died 1766), who in the same year published his epoch-making conjectures as to the documents used by Moses in the composition of Genesis; Augustine Calmet (died 1757), who published the first Bible dictionary; and Alexander Geddes (died 1802), who first embodied in a commentary (1792-97) the results of Pentateuchal documentary analysis. The intense study of natural science in England caused the critical inquiries of the Deists. After Herbert and Blount it was especially Anthony Collins (died 1729), the first in modern times to recognize that Daniel was written in the Maccabæan age, though Piscator perceived that the events of this time were referred to and John Toland (died 1722), whose labors advanced biblical science. On the other hand, the Quaker movement developed a conception of religious liberty and a reliance upon subjective judgment from which biblical interpretation ultimately derived great benefit. For the appreciation of Hebrew poetry Robert Lowth's treatise upon the subject in 1753 was of utmost importance. The Bible edition of Benjamin Kennicott (1776-80), together with its necessary supplement, G. B. de Rossi's *Variæ Lectiones* (1784-88), made it evident that all extant manuscripts represent substantially the same text recension. The still indispensable edition of the Greek Bible by Holmes and Parsons (1798-1827) was also begun in this century. J. Clericus (le Clerc, died 1736) made the Continent acquainted with the work of the English Deists, and enriched science with excellent commentaries. Hadrian Reland (died 1718) and Albert Schultens (died 1751) elucidated the text by their historical and philological investigations. Campegius Vitringa (died 1722) wrote a learned exposition of Isaiah, and J. G. Carpzov (died 1767) an excellent introduction to the Old Testament. Akin to the Deists, but more learned, was Hermann Samuel Reimarus (died 1768), whose *Wolfenbüttler Fragmente*, published by Lessing in 1774, searchingly examined the Pentateuch. Voltaire (died 1778) drew from English thinkers many of the arguments with which he undermined traditional beliefs concerning the Bible. Meanwhile the Quaker leaven was spreading. Pietistic exegesis was at first allegorizing, but gradually became infected with rationalism. The transition may be seen in Zinzendorf (died 1760), Edelmann (died 1767), C. F. Bahrdt, (died 1792), and J. D. Michaelis (died 1791); but especially in Johann Salomo Semler (died 1791), whose discussion of the Canon proved of great value, and Heinrich Corrodi (died 1793), whose studies of the chiliastic movements prepared him to understand the Book of Daniel. J. G. Herder (died 1803) contributed greatly to an understanding of Canticles and other poetic parts of the Bible. Influenced by the philosophy of Christian Wolff (died 1754), and that of Immanuel Kant (died 1804), a rationalistic school of biblical interpretation was formed, among whose chief representatives H. E. G. Paulus (died 1851), by his studies of prophecy and of the Book of Joshua; Karl David Ilgen, by his remarkable work on the documents in the Temple archives at Jerusalem (1798); and Paulus's disciple, Johann Gottfried Eichhorn, by his masterly introduction (1780-83), particularly furthered biblical exegesis.

The nineteenth century witnessed a marked progress in the interpretation of the Hebrew Bible. Among the Catholic exegetes Johann Jahn (died 1816), J. G. Herbst (died 1836), Franz Kaulen, and J. Cornely, by their introductions; Anton Scholtz, by his bold and thorough textual criticism; and Gustav Bickell, by his meritorious studies of Hebrew poetry, deserve special mention, though many others made substantial contributions. But the leadership in biblical exegesis was maintained by Lutheran theologians in Germany. It was largely, if not wholly, due to their influence that competent and independent interpreters appeared in other European countries and in America in the latter part of the century. Hegel, Schleiermacher, and De Wette made a deep impression upon theological thought, and their disciples reached with a bound many critical positions to which a later generation has been forced back after a significant and valuable reaction. W. M. L. de Wette (died 1849) recognized the mythical and legendary element in the Pentateuchal narratives, placed the date of the Deuteronomic law in the reign of Josiah, and discussed the character of the Chronicler's historiography. He became the chief representative of the fragmentary hypothesis of Geddes, introduced into Germany by Johann Severin Vater in 1802, though the possibility of a more extended document supplemented by later hands, which was presented by Stähelin, Bleek, and Ewald, subsequently attracted him. His pupils, C. P.W. Gramberg in 1829, Wilhelm Vatke and J. F. L. George in 1835, under the influence of Hegel's philosophy of history, traced the growth of customs and ideas, anticipating some important conclusions reached by later exegetes under the influence of the philosophy of evolution. Bruno Bauer in 1838 discussed the true character of the Book of Job and advocated its post-exilic origin. The ripest exegetical fruit of the rationalistic school was the commentary on Isaiah published in 1821 by Eichhorn's pupil, Wilhelm Gesenius (died 1842). That some of the critical positions were temporarily lost was not so much due to the vain attempts of Hengstenberg (died 1869), Hävernick (died 1845), and Keil (died 1894) to rehabilitate traditional views, as to the natural suspicion of a construction of Israel's history based on philosophical assumptions and to a truer appreciation of the potency of personality as against impersonal force. Quite the most influential Old Testament exegete of the middle of the century was Heinrich Ewald (died 1875). His learning, insight, and independence admirably fitted him to interpret the prophets and poets of Israel, but his sense of the historic development was not so keen. His most eminent disciple, August Dillmann (died 1894), in his learned and critical commentaries maintained some of Ewald's conservatism. Justus Olshausen, in his commentary on the Psalms (1853), first perceived clearly the essentially Maccabean background. Hermann Hupfeld (died 1866) in the same year brought Pentateuchal criticism back to the documentary hypothesis by a masterly characterization of the sources of Genesis, and later wrote an excellent commentary on the Psalms. The critical investigation of Jeremiah, begun by F. C. Movers in 1837, was carried on by Ferdinand Hitzig (died 1875), who also elucidated the Psalms and the minor prophets by his keen textual and literary criticism. The commentaries of August Knobel (died 1863) were marked by erudition and originality. In 1866 Karl Heinrich Graf proved that the laws of the priestly code were post-exilic; and the character of this priestly document was searchingly examined by the distinguished Semitic scholar Theodor Nöldeke, in 1869. Of great importance was the series of contributions by Julius Wellhausen to Pentateuchal criticism, begun in 1876, to which he has added a careful study of the text of Samuel (1871), and suggestive notes on the minor prophets (1892). The brilliancy of his style, the cogency of his reasoning, and the harmony of his conception of history with the doctrine of evolution have given a wide currency to his views. In 1881 the *Zeitschrift für alttestamentliche Wissenschaft* was founded by Bernhard Stade. In it much valuable work has appeared—none more important than that of the editor himself, whose critical acumen not less than his historical insight may also be seen in his history of Israel (1888). Another admirable historian, Eduard Meyer, has also enriched biblical criticism by many a contribution. Adalbert Merx, in an exceedingly learned and valuable commentary on Joel in 1879, paved the way for an understanding of that book. Karl Budde, by his *Biblische Urgeschichte* in 1883 and his studies on Judges and Samuel, as well as by his important discovery of the Kina metre, has done good service to biblical exegesis. Karl Siegfried by his painstaking studies in Hellenistic philosophy was admirably prepared for his thorough investigation of Ecclesiastes (1893). An exegete of marked originality and great ability is Bernhard Duhm, whose commentaries on Isaiah in 1892 and on the Psalms in 1899 have proved very helpful. Sympathetic insight and critical independence also mark the commentary on Genesis by Hermann Gunkel (1901). What is best in *Bunsen's Bibelwerk* comes from Adolf Kamphausen's hand. The contributions by Franz Delitzsch (died 1890) to the Keil-Delitzsch commentaries are particularly valuable for the author's profound knowledge of rabbinic lore. August Klostermann's commentary on Samuel and Kings (1887) exhibits a textual criticism as startlingly bold as the exegesis is conservative. Rudolf Smend's commentary on Ezekiel (1880) is particularly important. The series of commentaries edited by Michael Wilhelm Nowack contains many good expositions, and that edited by Karl Marti contains, among others, good commentaries by the editor himself on Isaiah (1900) and Daniel (1896). Karl Heinrich Cornill, in his study of the text of Ezekiel (1886), showed himself an excellent textual critic. No contributions to textual criticism during the century were more significant than those of Paul de Lagarde (died 1891), whose marvelous native resources, philological and philosophical, were mainly devoted to the Greek version.

In Holland Abraham Kuenen (died 1891), H. Oort, W. H. Kosters (died 1897), J. C. Matthes, and G. Wildeboer have rendered especially valuable services to biblical interpretation. Kuenen, a most conscientious and painstaking scholar, was the first to recognize that the priestly document, narrative as well as legislation, was post-exilic. Kosters first searchingly inquired into the historical character of the story of the return from Babylon. In France Eduard Reuss (died 1891) as early as 1833 expressed his conviction that Leviticus was post-exilic, and by his excellent translation of the entire Bible with commentary spread the results of a more fruitful Bible study among his countrymen. Ernest Renan (died 1892) commented with particular success on Ecclesiastes. The important epigraphical labors of eminent French scholars, particularly Clermont-Ganneau, have also been of considerable value to interpretation. In Great Britain Samuel Davidson, in editing the tenth edition of Horne's introduction (1856), introduced a more scientific view of the Hebrew Bible. More important, however, was the acute criticism of the Pentateuch and Joshua by J. W. Colenso (1862-79). Rowland Williams contributed to the understanding of the prophets (1866). By his thorough knowledge of Arabian antiquity W. Robertson Smith (died 1894) was able to throw much light upon the biblical writings. A. B. Davidson (died 1902) was a thoughtful and independent expositor. Samuel R. Driver, by his introduction, his commentaries, and his contributions to the Hastings *Dictionary of the Bible*, of which he is one of the editors, has won well-deserved confidence as an interpreter of the Bible. An eminent biblical exegete, an acute textual critic, and a resourceful and sympathetic expounder of the thought is Thomas Kelly Cheyne. His works upon Isaiah and the Psalter and in the *Encyclopædia Biblica* have distinctly advanced biblical science. German methods of interpretation became known in America through an essay on Messianic prophecy by George R. Noyes, in 1834, John G. Palfrey's lectures on Jewish history (1840), and Theodore Parker's translation of de Wette's introduction (1840). During the last two decades valuable contributions to biblical interpretation have been made by C. F. Toy, C. A. Briggs, George F. Moore, Henry P. Smith, Paul Haupt, and many others. The *Pulpit Commentary*, the *Expositor's Bible*, the *Cambridge Bible for Schools and Colleges*, the *International Critical Commentary*, the *Messages of the Bible*, and the *Temple Bible* are all written more or less from a modern critical standpoint. A work of great importance is the *Polychrome Bible*, edited by Paul Haupt, presenting, in different colors to indicate the different literary strata, a critically restored Hebrew text and the translation into modern English of this text.

OF THE NEW TESTAMENT.

To the Jewish Scriptures were gradually added by the post-Apostolic Church the distinctive writings of the Apostolic Age, as of the same authoritative inspiration as the older writings, and, consequently, open equally with them to the study and the practice of the Church. The first of these Christian writings to be studied were those which contained the life and teachings of Jesus, the earliest known example of such study perhaps being the reputed work of Papias (c.100), entitled *An Exegesis of the Sayings of Our Lord*, and based upon at least the Gospels of Matthew and Mark. Other efforts at Gospel exposition appear in the *Exegetica* of the Gnostic Basilides (died c.135); the *Hypomnemata* of the Valentinian Heracleon (c.150), and in the commentary on the Gospels held by some critics to have been written by Marcion (c.175). These works are preserved only in fragments, and from the little known of them they seem to have been written not only in a dogmatic spirit, which was doubtless due to the heretical position that most of the writers maintained toward the Church, but also after the allegorical method, which was the controlling principle of all interpretation in that age.

Evidence of this tendency to study the Gospels is further furnished by such works as Tatian's *Diatessaron* (c.170), an attempt to weave out of the four Gospels a single story of the life and teaching of Christ, in which composite Gospel Ephraem Syrus wrote a commentary; and by Marcion's reconstruction of the Gospel of Luke as the sole basis for the Gospel narrative. In fact, the numerous apocryphal Gospels are themselves witness to the primary interest which the second century took in the Gospel traditions.

No genuine exegesis of the New Testament writings, however, was produced until the rise of the Alexandrian school in the latter part of the second century, the most illustrative representative of which was Origen (c 185-254). His exegetical writings may be separated into three groups, which differ among themselves largely in the object they have in view. The first group (*Scholia*, Notes) consisted of brief exegetical remarks intended mainly for the elucidation of difficult passages; the second group (*Homiliai*, Homilies) consisted of expository discourses delivered in connection with public worship, and having as their purpose the instruction and edification of the general congregation; the third group (*Tamai*, Volumes) consisted of elaborate treatments of entire books of Scripture, with a view to making them intelligible to the more educated class. Of these groups only the last dealt in any comprehensive way with the New Testament. But in this group all the Gospels were treated, with the exception of Mark, and all the Epistles, excepting I. and II. Corinthians and I. and II. Timothy. No commentary is known on Acts, and it is uncertain whether he wrote on the Catholic Epistles and the Apocrypha. The spirit of this school's exegesis was, like that of the previous writers, dominantly dogmatic, while its method carried the use of allegory to a further extreme.

More historical in both spirit and method was the North African school, represented by such men as Tertullian (c. 200) and Cyprian (died 258), though it has left us nothing in the way of specific expository or commentarial work.

Antagonistic to the Alexandrian school stood the Syrian schools of Edessa and Antioch. The former of these had as its leader Ephraem Syrus (died 378), who produced both homilies and commentaries, the latter extending over the whole Bible, the portion on the Epistles of Paul being preserved in an Armenian translation. The leader of the latter school was Theodore of Mopsuestia (350-429), a scholar of commanding influence in his day, whose exegetical labors were extensive, though of his New Testament work only a Latin translation of his commentaries on Philippians, Colossians, and the Thessalonians, together with numerous Greek fragments from his treatment of other portions of the canon, have been preserved. The method of these schools, in distinction from the allegorical method of the Alexandrian school, was characteristically historical, having as its aim the discovery of the literal sense of Scripture; at the same time their conception of the doctrinal purpose of Scripture study compelled them frequently to resort to the hidden sense of the passage when the literal sense did not suffice. The exegetical influence of these schools, especially of the Antiochian, was far-reaching among the scholars of that day. The most illustrious example perhaps is found in Chrysostom (died 407), who, though developing his work most conspicuously in the form of the Origen homily, in which he covered almost the entire New Testament, wrought it out under the historical principles laid down by Theodore. Under this same influence, to a larger or less extent, stood also Athanasius (died 373), Basil (died 379), Gregory of Nazianzus (died c. 390), Ambrose (died 397), Gregory of Nyssa (died c. 395), Isidore of Pelusium (died 431), and Theodoret (died c.457). Unfortunately, however, this influence, while to some extent it made itself felt with all scholars of the fifth century, did not remain dominant with them. Theodore's doctrinal opposition to Origen raised against him the cry of heresy that finally brought him and his exegesis into disfavor, allowing Origen's allegorical principles to secure for themselves again a position of power, from which they were not dislodged until the Renaissance brought a new learning to the aid of a scientific method. This reviving influence of Origen is seen as early as Jerome (died c.420), whose exegetical labors, comprehending most of the New Testament, as well as of the Old, disclose a significant return to allegorizing; while it appears later in Augustine (died 430), who elaborated the threefold sense of Scripture suggested by Origen into a fourfold sense; and in Cyril of Alexandria (died 444), who became one of the most pronounced opponents of the Antiochian school.

The complete control of the allegorical exegesis, however, is seen in the mediæval period, which extended from the seventh to the fourteenth century, and which constituted throughout its larger portion the dark age of all scholarship and learning. This portion of the period contributed practically nothing to exegesis, the only attempt in such direction being the production either of excerpts from the exegetical writings of the Fathers, or of glosses upon them, the dominant purpose in all of which work was the support of the doctrines of the Church, and their sole method the elucidation of the hidden, allegorical Scripture sense. In the Eastern Church Origen, Chrysostom, and Cyril of Alexandria formed the favorite sources for these compilations, while the chief compilers in the New Testament field were Nicetas of Heracleon (eleventh century) and Macarios Chrysocephalos (fourteenth century). To these should be added Œcumenius (died 990), Enthymius Zigabenus (died 1118), and Theophylact (died 1107), whose commentaries, while possessing considerable original material, were after all compilative in character. In the Western Church, where the material was drawn mostly from Ambrose, Hilary, Augustine, and Jerome, this reproductive method was most extensively followed, its more prominent examples in the New Testament field being Cassiodorus (died c. 580), Bede (died 735), Alcuin (died 804), Rabanus Maurus (died 856), Peter Lombard (died c.1160), and Aquinas (died 1274); to whose more or less excerptive works should be added the distinctive glossaries of Strabo (died 849), Anselm of Laon (died 1117), Hugo of Saint Caro (died 1263), and Nicolas of Lyra (died 1340). With the last-named writer, however, began the dawn of a better exegesis. He had a knowledge of both Hebrew and Greek, which enabled him to guard against the allegorical absurdities that had been perpetrated upon the Church by ignorant men. While, therefore, he retained Augustine's conception of a fourfold sense in Scripture, he gave such preference to the literal sense as to make his glossary the most important contribution to exegetical study before the Reformation. With Nicolas of Lyra should be placed Lorenzo Valla (1406-57), whose independent spirit and liberal views made his *Annotations on the New Testament* a classic in the early Reformation times.

The exegesis of this early Reformation period was characterized by the revival of learning which marked the age. This is clearly seen in the exegetical work of Erasmus (c.1466-1536), the most conspicuous figure in this age. His publication of Valla's *Annotations* (1505), his edition of the New Testament in Greek, with comments on his emendations of the Vulgate text and explanations of different Scripture passages (1516), and even his more elaborate paraphrases of the Gospels and Epistles (1517-24), all of which had profound influence upon the growing Reformation thought, were conceived more in appreciation of the scholastic value of the original language of Scripture for doctrinal truth than in appreciation of the doctrine itself. Under similar influence of humanism, but with more of the Reformation attitude toward the doctrinal truth, stood Faber Stapulensis (c.1450-1536), who produced a new Latin translation of the Pauline Epistles, accompanied by a commentary (1512), a commentary on the Gospels (1522), and also on the Catholic Epistles (1525), and the first French version of the entire Scriptures—the New Testament being issued in 1523, five years before the Old—a version which formed the basis of the translation of Olivetan (1535); and also Justus Jonas (1493-1555), the first of whose commentaries (Corinthians, 1520) represented the humanism of Erasmus, but whose later work (Acts, 1524) was written in the evangelical spirit of the Reformation.

With the Reformation came a new era of exegesis. The scholarship of humanism continued, but with it was united a spiritual attitude toward the truth of Scripture and a practical application of it to personal life which made the Bible a new book. It was this religious element which formed the soul of the Protestant movement. The revival of learning had made the Scriptures an object of extraordinary study, but to the reformer these Scriptures were not merely a book for learning; they stood in a supreme way as a living revelation from God, the centre and circumference of which was Jesus Christ. Upon Him naturally, therefore, all exegesis was focused, and from Him it gathered a spiritual relation toward all the Scriptures which it could not otherwise have had. This combination of the scholarly and the spiritual produced a class of commentaries and expositions which, while burdened with the great dogmatic controversies of the times, were singularly true in method and practical in purpose. This is seen most markedly in Luther (1483-1546) and Zwingli (1484-1531), the former of whom in his comprehensive commentary on Galatians, and the latter in his fragmentary expositions of Matthew and Acts, and some of the Epistles, made the basis of their work the literal sense of Scripture and its value for the individual religious life. These characteristics are evident also in Melanchthon's (1497-1560) Expositions (Romans, 1522; John, 1523; Colossians, 1527; Gospels generally, 1544), the feature in which is not so much the classical learning of this remarkable scholar, that for two centuries exerted such a commanding influence on German education, as the rational method used and the ethical emphasis given to the truth. And even in the great commentaries (covering all the New Testament excepting the Apocalypse) of Calvin (1509-64), who was preëminently the theologian of the Reformation, this scientific method and this practical element are persistently in evidence. Yet with all the commentators and expositors of this period, the very emphasizing of the religious purpose of their work, and the centring of the truth with which they worked upon Christ, made inevitable more or less of a return to the old fault of allegorizing; though as between Lutheran and Reformed scholars it was the former who fell more frequently into this error, and the latter who developed more consistently the grammatico-historical principles of interpretation with which humanism had endowed the Reformation. These different tendencies are seen, on the one side, in the New Testament work produced by the following Lutheran exegetes: Strigel (died 1569), Brenz (died 1570), Camerarius (died 1574), Flacius Illyricus (died 1575), Chemnitz (died 1586), Cruciger (died 1597), and Chytræus (died 1600); and, on the other side, in the New Testament work of the following Reformed expositors: Pellicanus (died 1556), Meusel (died 1563), Bullinger (died 1575), and Beza (died 1605).

Humanism as a movement was too deep and profound in character and too widespread in extent not to have its influence within the Catholic as well as the Protestant Church, and this influence had its bearing too directly upon the study of the Scriptures not to affect significantly the course of this Church's exegesis. The evidence of this is manifest in the period of the Counter-Reformation, and especially at its beginning. Cajetan (1469-1534), on the threshold of the period, was liberal as a commentator. He treated most of the New Testament books, including the Apocalypse, and did not hesitate to differ in his interpretations from schoolmen and fathers alike; while he wholly abandoned their allegorizing manner of work. With him stood Sodaletus (died 1547), whose scholarly method in his commentary on Romans (1535) brought him to such vigorous views of doctrinal truth as were possible with loyalty to the Church, and Maldonatus (died 1583), one of the most brilliant lecturers on exegesis since Abélard's day, whose commentary on the Four Gospels (first published in 1596) shows not only a large freedom from the fathers, but a marked ability in the explanation of Scripture's literal sense. To these might be added, even in the later years of the period, Estius (died 1613), Mariana (died 1624), and Menochius (died 1655). As the period progressed, however, the interests of the Church developed a dogmatic spirit which forsook the truer methods. This is seen particularly in the Jesuit scholars Bellarmine (died 1621), who after approved scholastic manner made the Scriptures an arsenal for the defense of the Catholic faith; and Cornelius a Lapide (died 1637), who turned to the fathers for his materials; while it evidences itself more or less in Tirin (died 1636), and even in the earlier writers, Emmanuel de Sa (died 1596) and Salmeron (died 1591). Against this dogmatic position the Quietistic movement, represented by Francis of Sales (died 1622) and Jansen (died 1638), was practically a protest, though its spirit in handling the Scriptures tended rather to vitiate than to vitalize the sounder methods of interpretation. This is marked in the later developments of the movement, as seen in Quesnel's (died 1719) *Moral Reflections on the New Testament* (1687), the exegesis of which disclosed an ascetic spirit, and Madame Guyon's (died 1717) explications of the Holy Bible (Paris, 1715), which ran riot in mystical extravaganzas.

A development somewhat similar to this in the Catholic Church took place also in the Protestant Church. At the beginning of the Reformation the supreme interest in the Scriptures brought them into a place of high regard. As the period progressed, however, this regard grew and intensified until it became at last a reverence that placed the Scriptures in a position of supreme authority for the life and faith of the Church. In the same way the spiritual value given to the Scriptures at the first brought them into a place of practical ministry to the Church's faith and life. But with the progress of the period this life and faith grew in doctrinal importance, until the ministry which the Scriptures rendered came to be one of support and proof for the Church's dogmatic position. The return to allegorizing methods was in reality the threshold of this doctrinal development; but the full stage of the development is seen in the scholastic exegesis of the seventeenth century, especially among the Lutherans. Gerhard (died 1637), in his most important work, *Commentary on the Harmony of the Gospel History of the Passion, Resurrection, and Ascension of Christ* (Jena, 1617), to which he added a completion of the Chemnitz-Leyser harmony, shows almost a pietistic spirit and evidences remarkable patristic learning, yet treats Scripture as throughout the canonically authoritative source for dogma; while Salomo Glass (died 1656), in spite of comprehensive knowledge and grammatical method, burdens his *Philologia Sacra* (Jena, 1623-36) with casuistry and allegorism; and Calovius (died 1686) conceived his chief exegetical work, *Biblia Illustrata* (Frankfort, 1672-76), in the bitterness of a dogmatic polemic, dragging Scripture down to a mere collection of proof texts for Lutheran orthodoxy. Against this dogmatism arose the same protest as in the latter stage of the Counter-Reformation. The first intimation of it appeared in Calixtus (died 1656), who took an irenic position between Lutherans and Reformed, a position based on a lower estimate of Scripture than was current in his day, in which the almost idolatrous reverence for the book was laid aside. This protest came to its full issue in the pietistic school of Spener (died 1705), who in his *Misused Bible Passages* (1693) subordinated the interpreting of Scripture for the sake of the creeds to the study of Scripture for the sake of the religious life. This principle was carried forward and developed by his pupils, Francke (died 1727) in his exegetical lectures at Leipzig (1689) and his various hermeneutical writings and Anton (died 1730) in his Bible lectures at Halle (from 1695 on), and his occasional writings in the field of the devotional and practical life. In addition to these, Rambach (died 1735) produced in his *Institute of Sacred Hermeneutics* (Halle, 1724) and allied writings the first comprehensive presentation of the hermeneutical discipline, in which, however, the science of the study was endangered by the author's overpressure of the idea of inspiration. Midway between this confessional freedom of the Pietists and the symbol-worship of the Lutherans stood Bengel (died 1752), whose *Gnomon of the New Testament* (Tübingen, 1742) is the best exegetical product of the period. He had no extravagant ideas of inspiration, and yet was imbued with a profound sense of the religious value of the revelation contained in the words of Scripture; he was conscientious in the details of scholarship and yet comprehensive in the grasp of truth; he was finished in style and yet full of spiritual power.

This dogmatic development and reaction did not show itself so conspicuously among the Reformed exegetes, whether in Germany, Switzerland, or France. The New Testament work done by Paræus (died 1622), J. Capell (died 1624), Piscator (died 1625), Raphel (died 1715), Lampe (died 1729), and De Beausobre (died 1738), while burdened more or less with theological discussion and characterized by theological analysis, is nevertheless devoid of confessional motive and is remarkably true in method. Even in Holland, where the controversy between Arminians and Calvinists was bitter in the extreme, Bible interpretation was not distorted in the interests of party positions. This is evident on the Calvinist side in the exegetical work of Coceeius (died 1669), *Epistles, John's Gospel and Apocalypse*, and in the New Testament printed in his *Opera* (Amsterdam, 1676-78), which was directed against the dry scholasticism of Lutheranism, and reinstated in a measure the early Reformation methods, though its excessive typology opened anew the way to the old error of allegorism. It was also evident in the work of his pupils Van Til (died 1713) and Vitringa (died 1722). On the Arminian side it was equally evident in the great interpretative production of Grotius (died 1645), *Annotations on the Old and New Testament*, printed in *Opera* (Amsterdam, 1679), which in its method was free from the control of dogmatic prepossessions, the author's aim being to get at the plain historical sense of Scripture. The further fact that, among Reformed scholars generally, there was produced a class of books called *Observations* which, while contributing to various phases of Bible study, such as philology, chronology, geography, and natural history, did so along exegetical lines, is clear proof of how scholarly their method was and how free it stood from the slavery of symbolism. Workin this latter field were Scaliger (died 1609), Casaubon(died 1614), Drusius(died 1616), Bochart (died 1667), and Elsner (died 1750), to whom should be added Wetstein (died 1754), whose critical edition of the New Testament (1751-52) was one of the greatest contributions to biblical scholarship in the century.

In England, Lutheran scholasticism, with the accompanying protest against it, did not appear. There were all phases of theological belief, from hyper-Calvinism to Arianism, but Bible study preserved itself from confessionalism. Nothing more practical and devotional—and often nothing more scholarly—exists than the work of the English exegetes of the seventeenth and eighteenth centuries, as Hall (died 1656), Hammond (died 1660), Trapp (died 1669), Lightfoot (died 1675), Poole (died 1679), Pearson (died 1686), Henry (died 1714), Whitby (died 1726), Doddridge (died 1751), Lowman (died 1752), and Gill (died 1771).

Against all the dead scholasticism of German orthodoxy the devotional impulse of pietism was of no permanent avail. Its power was fully broken only by the deeper-reaching principles of the rationalism represented by such philosophers as Wolff (died 1754) and Lessing (died 1781), and reproduced in the work of such exegetes as Semler (died 1791), Eichhorn (died 1827), and Eckermann (died 1836)—a group of scholars whose New Testament expository work was founded on the idea, not only that the Apostles and Evangelists were influenced by their Jewish surroundings, but that their writings could be properly interpreted only from the viewpoint of these surroundings. The influence of Semler, *Preparation for New Testament Hermeneutics* (Halle, 1760), and his *Commentaries on John's Gospel, Romans, and Corinthians* (Halle, 1770-76), was significant and can be said to have prepared the way for all the later work of New Testament criticism, while in turn their inspiration may be assigned to Baumgarten (died 1767), *Exposition of the Holy Scriptures* (1742), and of Paul's Epistles (1749-67), who properly represents the translation from Pietism to rationalism. To this group should be added Gabler (died 1826) and Paulus (died

1851), scholars more extreme in their views, whose New Testament commentaries and hermeneutical writings, while marked by learning and critical skill, were thoroughly committed to a naturalistic exegesis and even sympathized with the mythical principles of Strauss (died 1874). Fritzsche (died 1846), whose commentaries on Matthew (1826), Mark (1830), and Romans (1836-43) are characterized by great philological ability, alone seems to have been uninfluenced by this rationalism, unless with him might be classed the earlier writer Koppe (died 1791), whose contribution (Galatians, Ephesians, Thessalonians, and Romans) to the *Greek New Testament with Annotations*, projected by Heinrichs and Pott, but not completed (Göttingen, 1783-98), is a piece of careful and impartial exegetical work; while Herder (died 1803) shows in his *Explanations of the New Testament* (Riga, 1775), *Letters of Two Brothers of Jesus* (Lemgo, 1775), and *Apocalypse* (London, 1821), a combination of rationalistic and mystical elements that makes him a forerunner of the Schleiermacher school, to which school should be assigned the later scholar de Wette (died 1849), whose *Exegetical Handbook on the New Testament* (Berlin, 1836-48) is remarkable for its religious convictions and its naturalistic results.

Naturally this rationalistic movement aroused orthodoxy to protest; but orthodoxy's dying powers were not equal to anything more than a feeble effort. In fact, the scholarly work of such men as Ernesti (died 1781), *Institutes of the New Testament Interpreter* (Leipzig, 1761); *Academic Lectures on Hebrews* (ib., 1815); his pupils, Morus (died 1792) and K. A. G. Keil (died 1818); and of J. D. Michaelis (died 1791), *Paraphrase of the New Testament, with Annotations* (Göttingen, 1790-91), all of whom belonged to orthodoxy, and sought to defend it, proved silent confessions of the hopelessness of the cause, and added rather to the rationalistic impulse. Ernesti's New Testament work, indeed, formed an epoch in hermeneutics by establishing the principle that Scripture has but a single sense—a literal one—and that this sense can be discovered only by the same means as are applicable to an ordinary human book; but this principle, derived really from Wetstein (died 1754), was in fact more opposed to the mysticism of pietistic interpretation than it was to the realism of rationalistic exposition. It was the foundation of the subsequent school of grammatico-historical exegesis, which was developed more fully by his immediate pupils, Morus and Keil. As a consequence, the latter members of this defensive group, J. G. Rosenmüller (died 1815), and especially Kühnöl (died 1841), were more in sympathy with rationalism than they were with orthodoxy.

The defense of the older Tübingen school differed from this weak effort of orthodoxy, inasmuch as its purpose was to support a supernatural Christianity rather than an authoritative confessionalism. Its best representatives in New Testament exegesis are Storr (died 1805), *Commentary on Hebrews* (Tübingen, 1789); his pupil J. F. Flatt (died 1821), *Commentaries on Most of the Epistles* (Tübingen, 1825-31), and Hess (died 1828), *Commentary on Acts* (Zurich, 1775); *Life of Jesus* (ib., 1781). But here, too, the late members of the school—e.g. the younger Bengel (died 1826) and Steudel (died 1837)—became more independent, and were allied rather with the naturalism against which they were supposed to stand.

What an orthodox and even a supernaturalistic exegesis were not able in themselves to effect against rationalism, however, was being brought about by the critical philosophy of Kant (died 1804), which in its unconscious emphasis of skepticism destroyed the confidence in reason as the criterion of revelation. The destructive efforts of this philosophy were supplemented constructively by the school of Schleiermacher (died 1834), who, standing in the midst of the rationalistic and evangelical struggle, seemed to partake of both tendencies and yet belonged really to neither. His New Testament exposition, limited in amount (*Commentary on Timothy*, Berlin, 1807; *Hermeneutics*, ed. by Lücke, ib., 1838; *Life of Jesus*, ed. by Rutenik, ib., 1864), is not the most valuable part of his work; but its influence on subsequent exegesis was pronounced. This is evident in the exegetical writings of Olshausen (died 1839; *Commentary on the New Testament*, continued by Ebrard and Wiesinger, trans., Edinburgh, 1847-49; *A Word on the Deeper Sense of Scripture*, ib., 1824; *The Biblical Exposition of Scripture*, Hamburg, 1825); Neander (died 1850; *Commentary on I. John, Philippians, and James*, trans., New York, 1859; *Life of Jesus*, trans., London, 1848); Lücke (died 1855; *Commentary on the Writings of John*, trans., Edinburgh, 1837; *Elements of New Testament Hermeneutics*, ib., 1816); Rückert (died 1871; *Commentary on Romans*, Leipzig, 1839; *Galatians*, ib., 1833; *Ephesians*, ib., 1834; *Corinthians*, ib., 1836-37); Tholuck (died 1877; *Commentary on Romans*, trans., Edinburgh, 1848; *John's Gospel*, trans., ib., 1836; *Sermon on the Mount*, trans., ib., 1860; *Hebrews*, trans., ib., 1852). It is true that none of these writers exactly represented Schleiermacher's position. They carried out his method of an organic interpretation of Scripture, but they developed it to evangelical degrees which Schleiermacher would not have accepted. This is particularly true of Tholuck, whose commentaries are deeply spiritual in tone and based on a profound conviction of the divine authority of Scripture, though free from any mechanical idea of inspiration.

Yet even the power of this profoundly influential school of exegetes was not sufficient to stop the skeptical impulses started by Kant's destructive philosophy. Even before Schleiermacher's death these had worked themselves out into the systems of Fichte (died 1814) and Hegel (died 1831), the latter of which afterwards formed the background for the mythical theory of Strauss (died 1874; *Life of Jesus*, trans., London, 1846) and the critical work of the later Tübingen school of Baur (died 1860; *Paul the Apostle*, trans., London, 1873-75). This school devoted itself to Church history and criticism rather than to exegesis. Only the following adherents of Baur can be said to have contributed specifically to New Testament exposition: Volkmar (died 1872; *Commentary on Apocalypse*, Tübingen, 1862; *Romans*, Zurich, 1875); Holsten (died 1897; *Commentary on Galatians*, Rostock, 1859; exposition of Galatians, Corinthians, and Romans in his *Gospel of Paul*, part i. only finished, Berlin, 1880). At the same time, however, it carried out to its results Semler's principle of the emphasis of the historical element in New Testament interpretation, but with such a skeptical attitude of mind toward the New Testament itself as to arouse the definite and distinct hostility, not only of the closer followers of Schleiermacher, but also of a group of exegetes who, while not so profoundly influenced by Schleiermacher's spirit, yet followed in the way of his organic treatment of Scripture. The better representatives of this group are: Winer (died 1858; *Exegetical Studies*, Leipzig, 1827; *Commentary on Galatians*, Leipzig, 1859); Bleek (died 1859; *Commentary on Hebrews*, Berlin, 1828-40; *Lectures on the Apocalypse*, ib., 1862; *Colossians, Ephesians, Philemon*, ib., 1865; *Hebrews*, Elberfeld, 1868; *Synoptical Explanation of the First Three Gospels*, Leipzig, 1862); H. A. W. Meyer (died 1873), editor of the *Critical Exegetical Commentary on the New Testament* (trans., Edinburgh, 1873, sqq.), to which he personally contributed in the first edition Matthew, Mark, Luke, John, Acts, Romans, Corinthians, Galatians, Ephesians, Colossians, Philemon, and Philippians; Beck (died 1878; *Exposition of Epistles to Timothy*, Gütersloh, 1879; *Apocalypse*, ib., 1883; *Commentary on Apocalypse*, ib., 1884; *Exposition of Romans*, ib., 1884; *Ephesians*, ib., 1891; *Epistles of Peter*, ib., 1896); Lange (died 1884), editor of the *Commentary on Holy Scripture* (trans., New Testament portion, Edinburgh, 1861-65), to which he personally contributed Matthew, Mark, John, Romans, James, and Apocalypse; Lechler (died 1890; *Commentary on Acts*, in Lange, Bielefeld, 1860); Ebrard (died 1888; *Commentary on Hebrews*, Königsberg, 1850; *Apocalypse*, ib., 1853; *The First Three Gospels*, trans., Edinburgh, 1853; *Epistles of John*, ib., 1859; *Gospel of John*, ib., 1860); Beyschlag (died 1900; *The Pauline Theodicy*, Berlin, 1869; *The Parables of Jesus*, trans., Edinburgh, 1875; *Commentary on Apocalypse*, ib., 1876; *Commentary on James*, in the last edition of Meyer, Edinburgh, 1897); B. Weiss (*Commentary on Philippians*, Berlin, 1859; *The New Testament Text Critically Investigated with Exegetical Notes*, ib., 1894-1900; *Commentaries on Matthew, Mark, Luke, John, Romans, Hebrews*, and *Epistles of John* in the last edition of Meyer, 1893-1901); Henrici (*Commentary on Corinthians*, 1880-87; *Corinthians* in the last edition of Meyer, 1896-1900).

Along with this opposition arose a more thorough-going one in the strictly conservative school of Hengstenberg (died 1869; *Commentary on Apocalypse*, trans., Edinburgh, 1851; *Gospel of John*, trans., ib., 1865), to which more distinctly belonged: Stier (died 1862; *Words of the Lord Jesus*, trans., Edinburgh, 1869; *Apostles*, ib., 1869; *Angels*, London, 1887; *Commentary on Hebrews*, Brunswick, 1862; *James, Epistles of Peter and Jude*, Berlin, 1850); Philippi (died 1882; *Commentary on Romans*, Gütersloh, 1878; *Galatians*, ib., 1884); K. F. Keil (died 1888; *Commentary on Matthew*, Leipzig, 1877; *Mark and Luke*, ib., 1879; *John*, ib., 1881; *Peter and Jude*, ib., 1883; *Hebrews*, ib., 1885). To these should be added the following later writers, belonging to the same general conservative attitude, though varying among themselves as to their degree of conservatism: Franz Delitzsch (died 1890), whose chief New Testament work was a *Commentary on Hebrews* (trans., Edinburgh, 1868-70); Luthardt (*Commentary on John's Gospel*, Nuremberg, 1852-53; *Apocalypse*, Leipzig, 1861; *Commentary on John's Gospel and Acts*, with Zöckler, trans., Edinburgh, 1878-79; *John's Epistles and Romans*, in Strack and Zöckler, Munich, 1886-88); Nösgen (*Commentary on Acts*, Leipzig, 1882; *Commentary on Matthew, Mark, and Luke*, in Strack and Zöckler, Munich, 1886-88); Zöckler, editor with Strack of the *Concise Commentary on the Holy Writings of the Old and New Testaments* (Munich, 1886-88), to which he personally contributed *John's Gospel* and *Acts* (with Luthardt), *The Pastoral Epistles, Hebrews and Apocalypse* (with Riggenbach), *Thessalonians* and *Galatians* in the last edition (Munich, 1894-98). Apart from all schools, occupying an unaffiliated and isolated position, yet bitterly hostile to the Tübingen school, is to be placed Ewald (died 1875; *Commentary on the Apocalypse*, Leipzig, 1828; *Exposition of the First Three Gospels*, Göttingen, 1850).

In this struggle the followers of Baur were not able to maintain their critical position, but abandoned it point by point, suffering their greatest defeat in the defection from their ranks of Ritschl (died 1889), who, in the second edition of his *Old Catholic Church* (Bonn, 1857), showed that the historical premises on which the exegesis of the school was founded were false. On the basis of this newly established position has arisen a school of exegesis which practically reproduces the Schleiermacher position of the separation of the critical and religious elements in biblical study. It has gained great influence and may be said to control the New Testament interpretation of to-day. The more prominent exegetes of this school are: H. J. Holtzmann, editor of the *Hand Commentary to the New Testament* (Freiburg, 1889-91), to which he contributed personally in the first edition *Matthew, Mark, Luke, John's Gospel and Epistles, the Apocalypse*, and *Acts;* Lipsius (died 1892; *Commentary on Romans, Galatians, Philippians* in the first edition of Holtzmann, ib., 1891); Schmiedel (*Commentary on Corinthians and Thessalonians* in the first edition of Holtzmann, ib., 1890); von Soden (*Commentary on Ephesians, Colossians, Philemon, Timothy, Titus, Hebrews, James, Peter, and Jude* in the first edition of Holtzmann, ib., 1891); Wendt (*Commentary on Acts* in the last edition of Meyer, Edinburgh, 1899); Kühl (*Commentary on Peter and Jude* in the last edition of Meyer, ib., 1897); Bousset (*Commentary on the Apocalypse* in the last edition of Meyer, ib., 1896); Bornemann (*Commentary on Thessalonians* in the last edition of Meyer, ib., 1894); E. Haupt (*The First Epistle of John*, trans., Edinburgh, 1879; *Commentary on the Captivity Epistles of Paul* in the last edition of Meyer, ib., 1897); Klöpper (*Commentary on II. Corinthians*, Berlin, 1869 and 1874; *Colossians*, ib., 1882; *II. Thessalonians*, ib., 1889; *Ephesians*, ib., 1891; *Philippians*, ib., 1893); J. Weiss (*Commentary on Epistles to Timothy and Titus*; also, with B. Weiss, *Mark* and *Luke* in the last edition of Meyer, Berlin, 1892).

In France, after Renan (died 1892) had supported and developed the mythical principles of Strauss, the best results in New Testament exegesis were produced by the conservative scholar F. Godet (died 1900; *Commentary on Luke*, trans., Edinburgh, 1875; *John*, trans., ib., 1879-80; *Romans*, trans., ib., 1880; *I. Corinthians*, trans., ib., 1886). In Holland the earlier writers were conservative in their tendency, being best represented perhaps by van Oosterzee (died 1882; *Person and Work of the Redeemer*, trans., London, 1886; *Commentary on Luke*, Edinburgh, 1863; the *Pastorals* and, with Lange, *James* in Lange, ib., 1858-62). The later years have been practically barren of New Testament exegesis.

The New Testament exegesis produced in Great Britain and America during the nineteenth century was not noticeably affected by the English Deism which closed the century preceding, nor to any degree by the various rationalistic movements which, during the first half of the century, so profoundly influenced the exegesis of Germany. The effect of Ritschlism is as yet not marked. In Great Britain such writers as Scott (died 1821; *Family Bible*, London, 1796-1825) and Adam Clarke (died 1832; *Commentary on the Holy Bible*, ib., 1810-26) continued the popular work of Henry, Doddridge, and Gill, but with better critical results. Scholars like Alford (died 1871; *The Greek New Testament with Commentary*, London, 1849-61); Ellicott (*Commentary on Galatians*, Cambridge, 1854; *Ephesians*, ib., 1855; the *Pastorals*, ib., 1856; *Philippians, Colossians, Philemon*, ib., 1857; *Thessalonians*, ib., 1858; *I. Corinthians*, London, 1887); J. B. Lightfoot (died 1889; *Commentary on Galatians*, London, 1865; *Philippians*, ib., 1868; *Colossians, Philemon*, ib., 1875; *Notes on Paul's Epistles*, ib., 1895); Westcott (died 1901; *Commentary on John's Epistles*, ib., 1883; *Hebrews*, ib., 1889; *John's Gospel*, ib., 1892); Eadie (died 1876; *Commentary on Colossians*, ib., 1856; *Philippians*, ib., 1859; *Ephesians*, ib., 1861; *Galatians*, ib., 1869; *Thessalonians*, ib., 1877); Plumptre (died 1891; *Commentary on Acts*, Cambridge, 1879; *Mark*, ib., 1879; *II. Corinthians*, ib., 1883); and MacPherson (*Commentary on Ephesians*, Edinburgh, 1892) produced works of permanent value, though generally conservative in their attitude. Stanley (died 1881; *Commentary on Corinthians*, London, 1862) and Jowett (died 1893; *Commentary on Galatians, Romans, Thessalonians*, London, 1859) represent a freer tendency. In America, New Testament exegesis was perhaps more conservative, though, with noted exceptions, not so remarkable for scholarship. Its best representatives were: Moses Stuart (died 1852; *Commentary on Hebrews*, Andover, 1827-28; *Romans*, ib., 1832; *Apocalypse*, ib., 1845; *Principles of Interpretation*, from the Latin of Ernesti, ib., 1842); J. A. Alexander (died 1860; *Commentary on Acts*, New York, 1856; *Mark*, ib., 1858; *Matthew*, ib., 1860); Hackett (died 1875; *Commentary on Acts*, Boston, 1851; *Philemon*, New York, 1860); C. Hodge (died 1878; *Commentary on Romans*, Philadelphia, 1835; *Ephesians*, New York, 1856; *Corinthians*, ib., 1857-59); Cowles (died 1881; *Notes on the Old and New Testaments*, New York, 1867-81); Conant (*Annotated Version of Matthew*, ib., 1860; *Revised Version of the New Testament, with Notes*, ib., 1866); Broadus (died 1895; *Commentary on Matthew*, Philadelphia, 1886); Hovey, editor of the *American Commentary on the New Testament* (Philadelphia, 1887-90), to which he personally contributed *John's Gospel* and *Galatians* (1890).

The growing needs of Sunday-school work produced in America a class of popular exegetical works for the use of teachers and older scholars in the school, such as Barnes's (died 1870) *Notes on the New Testament* (New York, 1832-52); Jacobus's (died 1876) *Notes on the Gospels* (ib., 1848-56) and *Acts* (ib., 1859). At the present time in Great Britain these needs are met by such series as the *Handbooks for Bible Classes and Private Students*, edited by Marcus Dods and Alexander Whyte (London, 1879-85); *The Cambridge Bible for Schools and Colleges*, edited by J. J. S. Perowne (ib., 1878-1901); also by the same editor *The Cambridge Greek Testament for Schools and Colleges* (ib., 1881-91). In America F. N. Peloubet has produced since 1875 a series of compilative *Notes on the Sunday School Lessons*. In the same popular line, though for more general use, are: in Great Britain, *The Pulpit Commentary* (1880 sqq.) edited by Canon Spence and J. S. Exell; *The Library Commentary*, by Jameson, Fausset, and Brown (1871); *Commentary for English Readers* (London, 1877-79), by Bishop Ellicott; *Biblical Museum* (1871-81), edited by J. C. Gray; *The Expositor's Bible* (London, 1888 et seq.), edited by W. Robertson Nicoll. In America: *Commentary on the Old and New Testaments* (New York, 1874-86), edited by D. D. Whedon; *Bible Work* (ib., 1887 et seq.), by J. G. Butler. For more advanced scholarly use is *The Holy Bible* (*Speaker's Commentary*, London, 1871-82), edited by Canon Cook (died 1889). In the front rank of critical and exegetical scholarship of the present time stands *The International Critical Commentary* (New York, 1895 et seq.). The New Testament books so far produced are: *Mark*, by E. P. Gould (died 1902); *Luke*, by Alfred Plummer; *Romans*, by William Sanday; *Philippians and Philemon*, by Marvin R. Vincent; *Ephesians and Colossians*, by T. K. Abbott; *Peter and Jude*, by Charles Bigg. With this may be ranked, in a way, the more concise but none the less scholarly reworking of Alford's *Greek Testament*, under the title, *The Expositor's Greek Testament* (London, 1897 et seq.), edited by W. Robertson Nicoll; the books thus far produced are: *The Synoptic Gospels*, by A. B. Bruce; *John's Gospel*, by Marcus Dods; *Acts*, by R. J. Knowling; *Romans*, by James Denny; *I. Corinthians*, by C. G. Findlay. More controversial, but also scholarly, may be added, *International Handbooks to the New Testament* (London, 1900 et seq.), edited by Orello Cone; the books thus far published are: *The Synoptic Gospels*, by George L. Cary; *Thessalonians*, by James Drummond; *Hebrews, Colossians, Ephesians, Philemon, Pastorals, James, Peter and Jude*, by Orello Cone.

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EXELMANS, āg'zĕl'mäɴs', RÉMY JOSEPH ISIDORE, Comte (1775-1852). A marshal of France. He was born at Bar-le-Duc, in the Department of Meuse, and entered the army in 1791. He was promoted to the rank of captain in 1799, served with distinction in the campaign in Naples under Macdonald and Championnet, and in 1801 was attached as aide-de-camp to the staff of Murat. In 1808, while with Murat in Spain, he was captured and sent to England, where he remained a prisoner for three years. Escaping, he rejoined Murat, and served with Napoleon in the Russian campaign in 1812. For his brilliant conduct the Emperor created him general of division. On the fall of Napoleon he was for some time banished from France, but was permitted to return after several years. In 1831 Louis Philippe restored him to the Chamber of Peers, and under the Presidency of Louis Napoleon he was made Grand Chancellor of the Legion of Honor and Marshal of France.

EXEMPTION (Lat. *exemptio*, from *eximere*, to take out, from *ex*, out + *emere*, to take, buy). The legal right to be excused from rendering certain services to the State, or to receive or retain certain property free from the claims of others. It is secured by a variety of statutes (popularly called exemption laws). Some of these designate the persons or classes who are not liable to jury duty or to military service. Others specify the portion of a decedent's estate which is to be set apart for the use and benefit of the widow and children, and which they are allowed to retain even in preference to the creditors of the deceased. Still others describe the property of a tenant which is free from distress for rent, or the property which is free from taxation, or from seizure under execution, or which may be retained by a bankrupt free from liability for his debts.

These statutes differ greatly in detail, but all have the common object of saving the family of a debtor from penury. The articles most generally exempted are necessary household furniture, tools used in a trade, a team, certain domestic animals, and a limited quantity of food supplies for the debtor's family. In some of our States the tendency is to increase exemptions unduly; but in all the courts are agreed that the policy of exemption is humane and wise, and that they should be very liberally construed. Some of the exemption laws protect a debtor and his family against an improvident attempt on his part to waive the benefit of the statute. For the particular exemption laws of any State, consult the statutes of that State, or Hubbel, *Legal Directory for Lawyers and Business Men* (New York, annually). See HOMESTEAD.

EXERCISE (Lat. *exercitium*, exercise, from *exercere*, to exercise, from *ex*, out + *arcere*, to ward off). A very important element of medical regimen, both in the preservation of health and in the cure of disease. To preserve all the functions of the body in normal condition, it is necessary to secure due and regular action, or exercise; to allow of complete inaction of any part or function is to invite disease, and probably even structural change, or atrophy. Hence the development of the muscular system, and even of the brain, requires the more or less regular use of exercise in the form of productive and useful work, or by means of artificially devised methods calculated to serve a like purpose in regard to the economy. Exercise, to be beneficial, must be attended with rest, to allow the tissues which are worn away during vital action to be restored. Passive motion (movement of limbs and muscles by another), massage, and electricity may take the place, in part, of volitional activity; but regular daily exercise, preferably out of doors, is essential to the health of every one. Indoor exercise may be obtained in a gymnasium, where many properly outdoor sports may be practiced, or where dumb-bells, wands, Indian clubs, chest-weights, swinging rings, horizontal and parallel bars, etc., admit of putting at work various groups of muscles. Outdoor exercise includes tennis, golf, bicycling, rowing, skating, running, swimming, walking, etc. Instructors in physical culture (or rational exercise for proper physical development) are employed by all large institutions of learning. See GYMNASTICS; PHYSICAL TRAINING.

EX'ETER. A city, civic county, Parliamentary and municipal borough, and river port, the capital of Devonshire, England, on the Exe, 10 miles northwest of its mouth, 170 miles west-southwest of London, and 73 miles southwest of Bristol (Map: England, C 6). It is a quaint old town, picturesquely situated on a hill amid hills. Its principal edifice is the cathedral, begun in 1100 and famed for the beauty of its design and the richness of its decorations. Its distinguishing external features are the two transeptal towers, a unique conception in English cathedrals, dating from the early part of the twelfth century, and the beautifully ornamented west front added in the fourteenth century. The dimensions are 408 feet in length by 140 feet across the transepts. The interior is notable for its fine proportions and perfect symmetry. Its special features are the carved minstrels' gallery, the bishop's throne with a lofty spire-like canopy, the sculptured stone choir-screen, and the modern reredos. Many of the monuments are well worthy of notice. The chapter-house, with a magnificent ceiling, contains a fine library, and among many valuable ancient manuscripts is Leofric's celebrated book of Saxon poetry. In the cathedral close are the episcopal palace and deanery.

High Street contains many ancient buildings, the finest being the Guildhall, dating from the fifteenth century, whose upper story projects over the sidewalk and forms an arcade supported by pillars. On an eminence near one of the railway stations are the ruins of Rougemont Castle, built by William the Conqueror, and remains of the ancient city walls. Part of the castle grounds now constitutes Northernhay Park. Among other buildings are Saint John's Hospital, founded in the reign of Henry III., the Albert Memorial Museum, opened in 1868, the Victoria Hall, lunatic asylum, and almshouses. Exeter has not been backward in municipal enterprise. It owns its water-supply and an electric plant. It maintains a technical college, public library and museum, public baths and wash-houses, parks, municipal band, an asylum, markets, a septic tank system of sewage treatment, and a cemetery. It sends one member to Parliament. Exeter has a large floating ship-basin, a ship-canal extending to Topsham, and extensive rock-hewn wine-vaults bordering its quay. It carries on a considerable shipping trade, the value of its annual imports exceeding $500,000. Exeter has unsurpassed nurseries, and exports dairy, farm, and orchard produce. Its chief manufactures are gloves and agricultural implements. It is the chief market for the celebrated Honiton lace. Exeter is on the Great Western and the London and South Western railways. Population, in 1891, 45,600; in 1901, 46,900.

In early times Exeter, the *Caer Isc* of the Britons, was most probably an important centre of trade with the Greeks and Phœnicians. To the Romans it was known as *Isca Damnoniorum.* Exeter was for a long time the centre of British resistance to the Anglo-Saxon invaders, and in 926, when Athelstan visited Exanceaster, he found it inhabited by British and Saxons alike. Athelstan surrounded the town with walls, so that it withstood an attack of the Danes in 1001. Two years later, however, they returned and plundered the town. In 1050 Exeter, as affording greater security, replaced Crediton as the episcopal see of Devonshire. The city was taken by the Conqueror in 1068, and by Stephen in 1137. During the Middle Ages it had a very important woolen trade, but later lost it. During the Civil Wars it was held by the Royalists from 1643 to 1646, when it surrendered to Fairfax. Consult: Oliver, *History of Exeter* (Exeter, 1821); id., *Lives of the Bishops of Exeter and History of the Cathedral* (London, 1861-81); Freeman, *History of Exeter* (London, 1890).

EXETER. A town and one of the county-seats of Rockingham County, N. H., 25 miles east of Manchester; on the Squamscott River, and on the Boston and Maine Railroad (Map: New Hampshire, L 10). The river affords good water-power, which is employed in cotton manufacturing. Other important products are: Iron and brass goods, machinery, boxes, and shoes. One of the oldest towns in the State, Exeter boasts of a large number of colonial houses. It has a public library of 14,500 volumes. The Phillips Exeter Academy (q.v.), which for generations has had a national reputation, and the Robinson Female Seminary, are situated here. The town was founded in 1638 by Rev. John Wheelwright, banished from Massachusetts, and was under the jurisdiction of Massachusetts from 1645 to 1680. During the Revolution it was the seat of the New Hampshire Government. Population, 1890, 4284; in 1900, 4922. Consult Bell, *History of the Town of Exeter* (Exeter, 1888).

EXETER BOOK, or CODEX EXONIENSIS. The name given to a manuscript anthology of Old English, or Anglo-Saxon, poetry, in possession of Exeter Cathedral. The volume has been identified with a book presented to the Cathedral by Leofric, the first Bishop of Exeter (1050-72), and described as "One great English book on various topics, composed in verse." The manuscript, 5$5\frac{1}{2}$×7$\frac{1}{2}$ inches, contains 123 leaves, or 246 pages, and is written on vellum. But for this volume, some of the finest Old English poems, as the *Christ,* would be lost to us. Consult: Gollancz, *The Exeter Book,* containing both the original text and a translation (London, 1895); and the excellent account of the book and of Leofric in the introduction to Cook, *Christ* (Boston, 1900). See also VERCELLI BOOK.

EXETER COLLEGE. A college of Oxford University. It was founded about 1314 by Walter de Stapeldon, Bishop of Exeter, for a rector, twelve scholars from the Diocese of Exeter, holding degrees in arts, and a scholar-chaplain. The foundation was a self-governing corporation, whose revenues, however, according to a somewhat frequent mediæval custom, were vested in another corporation, the Dean and Chapter of Exeter. Another curious provision was the annual election of the rector. The scholars first occupied two hostels, Hart Hall and Arthur Hall, and the establishment seems to have been called, from its founder, Stapeldon Hall. In 1565 Sir William Petre obtained a new charter for the foundation from Queen Elizabeth, and completely reorganized it, on the model of other Oxford colleges. The scholars were removed to buildings on the present site of the college, the rector was made a permanent official, and the name was changed to Exeter College. Scholarships were added by Petre and others, among whom in later years Charles I. was one, and the institution took on a new lease of life. The organization of the college was materially changed by the general readjustments in the university and colleges of recent years. New buildings have been added to the already picturesque quadrangle. Of these the chapel is especially noteworthy. It was designed by Scott, and has, as part of its interior decoration, a piece of splendid tapestry, designed by Burne-Jones and executed by William Morris. Of the older buildings, the hall is one of the most notable in the university. Among the distinguished men who have been connected with the college are Archbishops Secker and Marsh; Bishops Conybeare, Bull, Mackarness, Prideaux, and Hall; Anthony Ashley Cooper, first Earl of Shaftesbury; John Ford, the dramatist; Sir J. T. Coleridge, Lord Coleridge; J. A. Froude, the historian; Burne-Jones, William Morris, F. D. Maurice, and Lyell.

EXETER or **EX'ON DOMESDAY.** See Domesday Book.

EXETER HALL. A large proprietary building, on the north side of the Strand, London, 131 feet long, 76 feet wide, and 45 feet high. It was completed in 1831, and can contain upward of 3000 persons. Let chiefly for religious assemblies, it is in great request during the May meetings of the several religious societies. It is also let as a concert-room and has been the scene of many great musical fêtes. Having been often used by the dissenting bodies, by anti-slavery reformers, and by total-abstinence societies for great public meetings, 'Exeter Hall' has come to be used by the ultra-conservatives as a term to denote fanatical zeal, or the sort of moral earnestness which is by them regarded as 'bad form.'

EXHAUSTIONS (from Lat. *exhaurire*, to exhaust, from *ex*, out + *haurire*, to draw), Method of. A mode of proving certain mathematical propositions, variously attributed to Antiphon and Bryson, Hippocrates and Eudoxus. The formal statement of this method may be found in Euclid xii. 2. A familiar example is that of determining the area of a circle by means of the areas of circumscribed and inscribed polygons. The area of the circle lies between the areas of the polygons, and the latter approach indefinitely near it as the number of sides of the polygons is indefinitely increased. Archimedes used this plan in determining that π lies between $3\frac{1}{7}$ and $3\frac{10}{71}$. However, the idea of a circle being a polygon of an infinite number of sides is an essentially modern one, due chiefly to Kepler, and marks the passage of the method of exhaustions into the modern infinitesimal method. (See Calculus.) Consult: Chasles, *Aperçu historique* (3d ed., Paris, 1889); and Gow, *History of Greek Mathematics* (Cambridge, 1884).

EXHIBITIONS (Lat. *exhibitio*, from *exhibere*, exhibit, from *ex*, out + *habere*, to have), Industrial. The beginning of these exhibitions may be traced to the so-called 'fairs' held in the earlier periods of civilization, both in Asia and in Europe. These are supposed to have originated in religious gatherings, which first gave an opportunity for the exhibition and sale of wares to large numbers of people. From Italy they passed to France, where in 620 that of Saint Denis was instituted by Dagobert. Those of Aix-la-Chapelle and Troyes date from about 800, and they were introduced into Great Britain by Alfred the Great in 886. Toward the close of the tenth century they became common throughout northern Europe. Such fairs are still prevalent in Holland, although Germany is best known as the modern home of these institutions. The fair of Leipzig, for example, which dates from the twelfth century, is held three times a year, and attracts from 25,000 to 30,000 foreign merchants at each gathering. The great Russian fair at Nizhni Novgorod occurs in July and August, and the sales during its continuance are said to amount to many millions of dollars. The improvements in the methods of commerce have led to the institution of the more recent industrial exhibitions. These have for their chief object not the immediate sale of articles, but their exhibition to visitors as an advertisement which may ultimately increase the manufacturer's sales. The first of these modern exhibitions is believed to have been held in Paris in 1798, in the Maison d'Orsay, and included only articles of local manufacture. This exhibition, as well as another held in Paris during the same year, was so successful that Napoleon inaugurated a third exhibition in 1802, and this in turn led to the establishment of similar triennial exhibitions. The Royal Dublin Society began its series of triennial exhibitions in Dublin in 1829. At first only specimens of native industry were shown, but afterwards products of foreign manufacture were shown as well. These proved popular, and subsequently exhibitions were held periodically in other cities of the United Kingdom, notably in Birmingham, Liverpool, and Manchester. It was but natural that such exhibitions should extend to the United States, and the American Institute (q.v.) of New York, founded in 1828, had among its objects the holding of annual fairs at which inventors and manufacturers might exhibit their productions. The Franklin Institute of Philadelphia, founded in 1824, is of a similar character, and has from time to time had various expositions, chiefly devoted to the presentation of scientific developments. Also of a somewhat similar nature is the Saint Louis Exposition, which was organized in 1883, and during each year since its inception has held an exhibition of industrial products, accompanied frequently by a display of fine arts. The fairs of the Mechanics' Institutes were a natural development of such institutions, and prevailed locally for many years; but with the establishment of museums and libraries, which in recent years have combined under their management special exhibits organized for the occasion, the importance of the larger exhibitions has waned, especially in the United States. With the passing of these local exhibitions, there have come in the United States expositions that have been sectional rather than national or local in character, and also commemorative of some historical event. Among these may be mentioned the World's Industrial Cotton Culturist Exposition, which was held in New Orleans, La., from December 16, 1883, to June 30, 1884; the California Mid-Winter Exposition, held in San Francisco, from January 1 to July 4, 1894. This was followed by the Cotton States and Industrial Exposition, which was held in Atlanta, Ga., from September 15 to December 31, 1895; the Tennessee Centennial Exposition (q.v.), held in Nashville, Tenn., from May 1 to October 31, 1897; the Trans-Mississippi Exposition (q.v.), held in Omaha, Neb., from June 1 to November 1, 1898; the Pan-American Exposition (q.v.), held in Buffalo, N. Y., from May 1 to November 2, 1901; and the South Carolina Inter-State and West Indian Exposition (q.v.), held in Charleston, S. C., from December 1, 1901, to June 1, 1902. Of less importance have been the special expositions, such as the Chicago Railway Exhibition, held in Chicago, Ill., in 1882; the Cincinnati Industrial Exposition, held in Cincinnati, Ohio, in 1883; the Electrical Exhibition, held in Philadelphia, Pa., in 1884; the Marietta Centennial Exposition, held in Marietta, Ohio, in 1888; the Patent Centennial Celebration, held in Washington City in 1891; the National Export Exposition, held in Philadelphia, Pa., in 1899; and the Printing Exposition, held in New York City in 1900.

Among the expositions, many of which were international, that have been held in recent years and were devoted to some special subject, may be mentioned the following: of articles connected with the leather industry, in Berlin in 1877; of all kinds of paper and pasteboard, in Berlin in 1878; of fisheries, in Berlin in 1880; of electrical appliances, in Paris in 1881; of geographical exhibits, in Venice in 1881; of cotton, in Atlanta, Ga., in 1881; of early data in American history, in Madrid in 1881; of fisheries, in London in 1883; of historical matters pertaining to Columbus and the discovery of America, in Madrid in 1882; of hygienic, chemical, pharmaceutical, and sanitary objects, in Naples in 1894; of German products and industries, in Berlin in 1896; and of fisheries, in Bergen, Norway, in 1898.

The success of many of the earlier local expositions led to the inauguration of a series of expositions of international character. The first of these, which was announced in 1849, was held under the direction of the Society of Arts in London. The exhibition was opened on May 1st, and continued until October 15, 1851, during which time 6,039,195 persons visited it. The total number of exhibitors was 13,938, of whom 6556 were from foreign countries, and the remainder from Great Britain and her colonies. The exposition was a financial success, the receipts from admission fees and subscriptions amounting to $2,444,718, while the expenses were nearly $1,600,000. The history of the exposition has been preserved in several works, and perhaps most fully in the thirteen volumes of reports issued by the commissioners. Its success led the Royal Dublin Society to make its exhibition in 1853 an international one. The exposition was opened on May 12, 1853, and for the first time the display of paintings as a regular feature was introduced. The total number of visitors was about one million, but the exposition proved a failure, as the receipts were less than one-half of the expenditures.

During the same year an Exhibition of the Industry of All Nations was held in New York City. The site chosen was on Sixth Avenue between Fortieth and Forty-second streets, the place being now known as Bryant Park. The principal building was in the form of a Greek cross surmounted by a dome in the centre, and the triangular spaces between the arms of the cross were roofed over at the first story for the purpose of obtaining additional space. In the allotment of space one-fourth of the building was devoted to the exhibits of the United States, one-fourth to those of Great Britain and Ireland, one-fourth to Germany, France, and Belgium, and the remainder to the exhibits of other nations. The exposition was opened with appropriate exercises by President Pierce on July 14, 1853. The cost of the building and running expenses was raised by the issuing of stock to the amount of $500,000, but, notwithstanding the interest aroused, it was a financial failure.

The next exposition of importance was that held in Paris in 1855, and known as the Paris International Exposition. The site chosen was the Champs Elysées, where the main building, in the form of a parallelogram 827 feet long by 354 feet in width, was erected as a permanent structure to receive future expositions or to serve for great public ceremonies and for civil and military fêtes. In addition to the Palais de l'Industrie, as the main building was called, there were separate structures for the exhibition of the fine arts, agricultural implements and products, etc. This exposition began on May 15 and continued to November 15, 1855, during which time the visitors numbered about four and one-half millions. The industrial and art exhibits shown on this occasion were considered superior to those of all previous international expositions. The expenses amounted to upward of $5,000,000, while the receipts were scarcely one-tenth of that amount.

Several minor expositions were held in Europe during the years that followed, notably in Edinburgh and Manchester, in Great Britain, and in Munich in Bavaria; but the next international exhibition of importance was held in London in 1862. The site chosen was a tract of land in South Kensington, covering an area of about 24 acres, where a permanent structure was erected. About one-half of the space was allotted to the exhibits of the United Kingdom and its colonies, and the other half to foreign countries, and the total number of exhibitors was 28,653. The exhibition was opened on May 1, and closed on November 1, 1862. The number of visitors is given as 6,211,103. The total cost and expenses of the exhibition amounted to nearly $5,000,000, but the receipts failed to reach that sum by a comparatively small amount.

Minor expositions, although of an international character, were held in Constantinople in 1863, in Dublin and in Oporto in 1865, and in Stockholm and Melbourne in 1866.

In 1864 it was decreed by Emperor Napoleon III. that an international exposition should be held in Paris in 1867. A commission was appointed with Prince Jerome Napoleon as president, under whose direction the preliminary work was begun. The site chosen was the Champs de Mars, the great military parade ground of Paris, which covered an area of 119 acres and to which was added the island of Billancourt, of 52 acres. The principal building was rectangular in shape with rounded ends, having a length of 1608 feet and a width of 1247 feet, and in the centre was a pavilion surmounted by a dome and surrounded by a garden, 545 feet long and 184 feet wide, with a gallery built completely around it. In this building were seven concentric galleries, the central space in each of which was allotted to the exhibits of a country, while radial avenues extended from the garden, separating the sections of the several nations from each other. This arrangement was adopted so as to display similar goods from different nations in such a manner that they could be readily compared and studied. In addition to the main building, there were nearly a hundred smaller structures on the grounds. There were 50,226 exhibitors, of whom 15,055 were from France and her colonies, 6176 from Great Britain and Ireland, and 703 from the United States. The funds for the construction and maintenance of the exposition consisted of grants of $1,165,020 from the French Government, a like amount from the city of Paris,

$1,553,360 as a guarantee fund, and about $2,000,000 from public subscription, making a total of $5,883,400; while the receipts were estimated to have been but $2,822,900, thus leaving a deficit, which, however, was offset by the subscriptions from the Government and the city of Paris, so that the final report was made to show a gain. The exhibits were examined by a jury which included some 600 experts, among whom were many of the foremost scientific men of the world. The exposition was formally opened on April 1, and closed on October 31, 1867, and was visited by 9,238,967 persons. This exposition was the greatest up to its time of all international expositions, both with respect to its extent and to the scope of its plan.

After minor expositions held in Havre in 1868, Amsterdam in 1869, Sydney in 1870, and Moscow in 1872, the next great international exposition was that held in Vienna in 1873. Preliminary announcements were issued by the Austrian Government in 1871, and a commission, of which Archduke Charles Louis was protector and Baron de Schwartz Senborn chief manager, was charged with its inauguration. Accordingly a site on the Prater was chosen, covering 280 acres, where an Industrial Palace consisting of a central nave 2953 feet long, 83 feet 8 inches wide, and 73 feet 10 inches high, of six intersecting transepts each 572 feet 6 inches long, 51 feet 1 inch wide, and 41 feet high, and of a great rotunda, the largest in the world, of 354 feet diameter at the middle of the nave, was built. Other important buildings were a Machinery Hall, an Art Building, and Agricultural Halls, and also a large number of smaller special buildings. There were 55,492 exhibitors, whose exhibits were classified into 26 groups, and were duly examined by an international jury of awards, who distributed diplomas of honor and medals for progress, merit, good taste, fine arts, and for coöperators. There were 643 exhibits shown by the United States, for which 349 awards were made as well as 26 medals for good taste and coöperation, making a total of 375. The cost of the buildings and running expenses was nearly $10,000,000, while the receipts were about $2,000,000, leaving a deficit of nearly $8,000,000, which was made up by Government appropriation. The total number of visitors was 7,254,687. At this exposition was inaugurated the custom of gathering together men interested in various specialties, whose meetings took the form of congresses. Among these were the International Patent Congress, the International Congress for National Economy, that for Complex Instruction, Linen Industries, etc. The exposition was opened with appropriate ceremonies on May 1, and closed on October 31, 1873.

The importance and value of international expositions shown by those held abroad led to a determination on the part of the United States to celebrate the centennial of the independence of the United States by an international exposition to be held in Philadelphia in 1876, a description of which forms the subject of a special article under the title of CENTENNIAL EXPOSITION, INTERNATIONAL (q.v.).

The French Government, desirous of showing to the world the assured success of the Republic, and incidentally to recommend the French system of industrial protection, determined to hold a universal exposition in Paris in 1878, and an invitation was issued by President MacMahon inviting all nations to participate. The site selected was the Champs de Mars, as in the exposition of 1867, to which was added an elevated plateau on the opposite side of the Seine, known as the Trocadéro, and connected by the historical bridge of Jena. The main building, of iron and glass, was rectangular in form, and covered 27,900 square yards. The art galleries and the buildings erected for the special exhibits made by the authorities of the city of Paris occupied a court in the centre of the building. The Palace of the Trocadéro was of stone, and remained as a permanent memorial of the exposition. In addition there were numerous smaller structures in which special exhibits were shown, and the various buildings of foreign governments. The cost of the exposition was over $6,000,000, which sum was raised by grants from the French Government and the city of Paris, but the receipts were only about $2,000,000. The total number of exhibitors was about 52,835, which was less than in Vienna, and was explained by the fact that several governments, including Germany, refused to participate in the exposition. The exhibits were viewed by an international jury who distributed among the exhibitors from the United States 10 grand prizes, 7 special prizes, 143 gold medals, 224 silver medals, 277 bronze medals, and 208 honorable mentions. International congresses were held continuously throughout the exposition, and in all some thirty were convened at which representatives from foreign governments were present and discussed the subjects under consideration. The exposition was formally opened on May 1, and continued until October 31, 1878. The total number of admissions to the exposition was 16,159,719.

Among the minor expositions that followed the Paris Exposition may be mentioned those held in Amsterdam in 1883, Calcutta in 1884, Antwerp in 1885, Edinburgh in 1886, and Melbourne in 1888.

It had become a custom for the French Government to hold an exposition every eleven years, and accordingly invitations were issued to foreign governments to attend a universal exposition to be held in Paris in 1889, ostensibly to celebrate the centenary of French independence. The grounds selected for the exposition were the Champs de Mars, 128 acres; the Trocadéro Garden, 42 acres; the Esplanade des Invalides, 38 acres; and the Quai d'Orsay from the Champs de Mars to the Ministry of Foreign Affairs, 20 acres, making a total of 228 acres. The principal building was the Palace of Industries, which was a large parallelogram flanked by two wings and covering 1,138,930 square feet. It was surmounted by a central dome 195 feet high and having an exterior diameter of 120 feet. Beyond this were the twin palaces of the Fine and Liberal Arts, each of which covered 202,232 square feet and was surmounted by a cupola 183 feet high. Numerous other smaller structures were on the grounds, including those of various governments. The important architectural feature of the exposition, however, was the famous Eiffel tower (q.v.), 984 feet high, which remained as a memorial. The total number of exhibitors was over 61,722, whose displays were examined by a jury of awards who recommended 33,139 awards. More than seventy international congresses convened during the exposition and delegates from various governments were appointed to discuss the subjects that were brought before them. The exposition was opened on May 6, and closed November 6, 1889, and was visited by 25,121,975 persons.

No expositions of importance took place in the years that followed until 1893, when the four hundredth anniversary of the discovery of America was celebrated in the United States by the World's Columbian Exposition (q.v.), held in Chicago, Ill.

Subsequent to the World's Fair held in Chicago, many of the exhibits shown there were taken to San Francisco, and an exhibition known as the California Mid-Winter Exhibition was held during 1894, and this was followed in the United States by a series of commemorative expositions, a list of which is given elsewhere in this article. Likewise there were several minor expositions abroad, of which perhaps the most important was that held in Brussels in 1898, at which commissioners representing the United States were present.

The proposition of holding a World's Fair in Paris in 1900 began to take shape as early as 1892. The location chosen was that similar to the previous expositions, and included the Champs de Mars and the Trocadéro Garden, the Esplanade of the Invalides, together with narrow strips on each bank of the Seine, connecting on the south side the Esplanade of the Invalides with the Champs de Mars, and on the north side connecting the park of the Art Palaces with the Trocadéro, making in all an area of 336 acres, also with an annex in the Bois de Vincennes devoted to exhibits of transportation and sports. Across the river on the Esplanade of the Champs de Mars were the special buildings devoted to the exhibition of science and art, education, engineering, and means of transportation, mechanical industries, agriculture and food, chemistry, mechanical appliances, textile industries, mining and metallurgy, etc.; while those along the south bank of the Seine were the buildings of the naval and military exhibits, followed by the structures erected by the various nations, until the Esplanade des Invalides was reached, where were the palaces of foreign industry and decorative art. For the erection of these various buildings and running expenses of the exposition a fund amounting to upward of $27,000,000 was raised, part of which was contributed by the National Government, by the municipality of Paris, and part by the issuing of bonds, each of which had a face value of twenty francs, and consisted of twenty admission tickets with numbers for various lottery drawings, and also by a sum of money advanced by the Bank of France. Exhibits were classified into 18 groups, the subdivisions into 121 classes. The official catalogue gave 79,712 exhibits, of which 31,946 were from France, and 6674 from the United States. An international jury of awards examined the exhibits, recommending 42,790 awards. The usual series of international congresses were held and announcements for over one hundred and twenty-five were made. The exhibition was opened on April 14, and continued until November 11, 1900, during which time it was visited by more than 50,000,000 persons, and on September 6 600,528 were reported to have passed through the gates, which was the largest attendance for any single day. A financial statement issued at the close of the fair showed a deficit of about $400,000, so that the exposition may be considered to have been a financial success, especially when it is remembered that the value of the permanent buildings was very much greater than the deficit.

This summary of the history of world's fairs properly closes with the announcement that an exposition will be held in Saint Louis in 1903, known as the Louisiana Purchase Exposition, in celebration of the centennial anniversary of the purchase of the Territory of Louisiana from France, which it is reasonable to expect will exceed all previous world's fairs in richness of exhibits, beauty of installation, and splendor of architectural designs.

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EXILE. See BABYLONISH CAPTIVITY.

EXILE. Expulsion from one's native country by government authority for a period or for life; also, residence abroad in a foreign land either under compulsion by law, or voluntarily to avoid some form of punishment exposure to which would follow continued residence in the native land. Exile in the first sense (expulsion) may be either simple exclusion upon pain of death or some lesser penalty, or may take the form of transportation to some foreign or secluded land to which the exiled person is confined.

Among the Greeks exile was the legal punishment for homicide, murder of an alien, instigation to murder, and malicious wounding; but it did not originally exist among the Romans, although the interdiction of fire and water practically amounted to the same thing. As a political measure expulsion from the country was resorted to in Greece, and it might involve loss of the rights of citizenship and the forfeiture of property, except in cases of ostracism (q.v.).

At Rome the interdiction of fire and water (*interdictio aquæ et ignis*) was the penalty for such serious crimes as treason, arson, and poisoning; and the accused was at liberty to anticipate an unfavorable result of a trial by going into voluntary exile. This voluntary exile did not arise as a substitute for punishment at home, but from the fact that the interdict was a survival of a ruder form of justice in which the State merely outlawed the criminal and left him to the private vengeance of the injured parties, which he escaped by fleeing to the protection of foreign lands whither the State had no reason to pursue him. Loss of civic rights therefore, did not follow voluntary exile unless the exile was declared to be deserved, or the interdiction was subsequently pronounced, or the refugee became a citizen of a foreign State. Confiscation of property took place only in extreme cases. Sometimes the interdict was pronounced for political purposes, as in the case of Cicero. Originally it was pronounced by the Comitia Centuriata, and later by the judicial commissions appointed to try offenses.

Direct expulsion was first practiced under the Empire under the names of *deportatio* and *relegatio. Deportatio* was a form of banishment to a specified locality (usually an island) involving loss of civic rights and usually forfeiture of property; *relegatio* was a milder form which did not affect the rights of the man as a citizen. Among modern nations exile survives as a punishment in the form of transportation to penal colonies or settlements, as in the case of the former penal colonies of Australia and Tasmania (Van Dieman's Land) of Great Britain, and the Siberian colonies of Russia (see AUSTRALIA; TASMANIA; SIBERIA); but with the increase of civilization this form of punishment is being abandoned.

The right of an alien to demand and receive protection for his person and property in the country where he resides has always received general recognition, among civilized nations, and aliens who are refugees from punishment for political crimes or *mala prohibita* and not *mala in se* (see CRIME) are not among the classes included in the treaties for extradition now commonly existing between civilized nations. This protection, however, is territorial only and extends solely to those aliens within the boundary of the State, unlike the protection to citizens which the State affords at all times and places. Such a refugee is amenable to the laws of the country where he resides, and may there be punished for any acts there committed by him which are crimes by the law of that land; but the fact that he is an accomplice in plots against his native country with others there is rarely considered a reason for surrendering him upon demand, except when the demand is made by a superior power which will not brook a refusal. For further information consult such related articles as ALIEN; EXTRADITION; PUNISHMENT; BANISHMENT; TRANSPORTATION, and the authorities referred to under ALIEN; EXTRADITION; PUNISHMENT; INTERNATIONAL LAW, etc.

EX'INE (from Lat. *ex*, out). In plants, the outer one of the two layers of a spore-wall, the inner one being called the intine. The exine is the protective layer, being comparatively thick and impervious, and often developing a rough surface or appendages of various kinds. It is often called the exospore. See SPORE.

EX'MOOR. A former forest, but now a moorland region, 30 square miles in area, in the west of Somersetshire and northeast of Devonshire (Map: England, C 5). It consists of dark ranges of hills, deep wooded glens, and lonely valleys. Its highest point is Dunkery Beacon, 1707 feet above sea-level. It is the sole remaining habitat of the wild red deer of England, and is known for distinctive breeds of sheep and ponies. It has iron and copper mines, and is graphically and romantically described in Blackmore's *Lorna Doone.*

EXMOUTH, ěks'mŭth (AS. *Exan mūþa,* mouth of the Exe). A seaport, market-town, and watering-place of Devonshire, England, on the English Channel, at the mouth of the Exe, 10 miles southeast of Exeter (Map: England, C 6). It is picturesquely situated on a hill rising from the sandy estuary of the Exe, and is noted for its mild climate. The Woodbury hills, 800 feet high, protect it from the east winds. It is an attractive little town, with a good beach for bathing, a fine sea-wall, handsome terraces and promenades, assembly-rooms, libraries, and the usual attributes of a watering-place. New docks were opened in 1869. Its chief industries are lace-making and fisheries. Population, in 1901, 10,500. The town is of considerable antiquity. Here Sweyn, the Dane, landed in 1003. It was taken by the Royalists in 1646.

EXMOUTH, EDWARD PELLEW, Viscount (1757-1833). An English admiral. He was born at Dover, of a Cornish family. He was educated at the Truro Grammar School, and entered the navy at thirteen years of age. When only nineteen he showed conspicuous gallantry, after his superior officers had been severely wounded, by saving his vessel in the battle of Lake Champlain, October 11, 1776. In command of a naval brigade, he took part in Burgoyne's campaign in the following year. In 1782 he attained the rank of post captain, and in 1793 he captured the *Cléopatre*, a French frigate. For this victory he was knighted. In 1799, in command of the *Impétueux*, he harassed the French coast and won several brilliant actions. In the same year his personal influence and bravery quelled the mutiny in Bantry Bay, and saved the British fleet to the country. In 1804 Sir Edward Pellew was advanced to the rank of rear-admiral of the red; in 1808 to that of vice-admiral of the blue; and in 1814 was created Baron Exmouth of Canonteign, Devonshire. In 1816 he went to Algiers with a fleet of sixteen vessels to enforce the abolition of Christian slavery, and the liberation of all Christian slaves. Three thousand Christians, mostly Spaniards and Italians, were freed and conveyed to their respective countries. Exmouth received the thanks of Parliament on his return to England, and was promoted to the rank of viscount. In 1821 he retired from public service. Consult Osler, *Life of Admiral Viscount Exmouth* (London, 1844).

EX'NER, KARL (1842—). An Austrian physicist. He was born at Prague, and was educated at Vienna and Zurich. In 1885 he became president of the Chemico-Physical Society in Vienna, and in 1892 he was appointed lecturer at the university. His publications include: *Ueber die Frauenhoferschen Ringe* (1877); *Ueber das Funkeln der Sterne* (1881); *Ueber Beugungserscheinungen* (1885); *Ueber die polarisierende Wirkung der Lichtbeugung* (1890-92).

EXNER, Siegmund (1846—). An Austrian physiologist. He was born at Vienna, and after studying there and at Heidelberg established himself as lecturer at the Vienna University, where in 1875 he became professor of physiology. He made numerous investigations on the physiology of the nervous system, and twice received the prize awarded by the Vienna Academy of Sciences for original researches. His publications include the following works: *Leitfaden bei der mikroskopischen Untersuchung tierischer Gewebe* (2d ed., 1878); *Untersuchungen über die Lokalisation der Funktionen in der Grosshirnrinde des Menschen* (1881); *Die Innervation des Kehlkopfes* (1884). In 1887 he became co-editor with Gad of the *Centralblatt für Physiologie.*

EXNER, Wilhelm Franz (1840—). An Austrian technologist. He was born at Gänserndorf, and was educated at the Polytechnic Institute of Vienna. In 1874 he was appointed inspector of industrial schools in the Ministry of Commerce. In association with Banhans and others he founded in 1879 the Industrial Museum at Vienna, of which institution he subsequently became director. He was elected to the Austrian Chamber of Deputies in 1882, 1885, and 1891. His works include: *Das Biegen des Holzes* (3d ed., 1893); *Das moderne Transportwesen im Dienste der Land- und Forstwirtschaft* (2d ed., 1880); *Werkzeuge und Maschinen zur Holzbearbeitung* (1878-83); and *Die Hausindustrie Oesterreichs* (1890).

EXODUS (Lat., from Gk. ἔξοδος, *exodos,* way out, from ἐξ, *ex,* out + ὁδός, *hodos,* way). The Latin name of the second book of the Pentateuch, so called from the fact that it treats of the deliverance of the Hebrews from Egypt. It contains, however, much more than this. Taking up the narrative with the death of Joseph, where Genesis left off, it recounts the oppression of the Hebrews by their Egyptian taskmasters; the birth, youth, and call of Moses (chs. i.-vi.); the plagues and the deliverance from Egypt (vii.-xv.); the way to Sinai and the establishment of the Covenant with Jehovah, incidental to which a series of laws is set forth (xvi.-xxiv.); directions for the construction of the tabernacle (xxv.-xxxi.); the sin of the golden calf (xxxii.-xxxiv.); and the making of the tabernacle and its furniture, concluding with the setting up of the edifice (xxxv.-xl.).

It will thus be seen that Exodus is a mixture of historical narrative with legislative portions. The chief sections of the latter are: (1) Exodus xx. 23, known as the Book of the Covenant; (2) the Decalogue (Ex. xx. 1-17); and (3) an older Decalogue (xxxiv. 10-28). (See Decalogue.) It is the opinion of the critical school that these legal sections date from different periods and represent independent compositions, and that in the historical sections we find the usual traces of the Elohistic and Yahwistic histories in the combination known as JE. (See Elohist and Yahwist.) It is generally supposed by critics that J (the Yahwistic history) included the older Decalogue (Ex. xxxiv. 10-28), and that in E (the Elohistic history) was embodied the second Decalogue and the Book of the Covenant, so that the further work of the later writers was to combine these historical and legislative portions with the so-called Priestly Code (P), at the time that Genesis and the three books following Exodus were combined into the present Pentateuch. See Genesis; and, for the relationship of the Book of the Covenant to the other codes, see Hexateuch.

Consult the commentaries on Exodus, particularly those of Dillman, Bentsch, and Kalisch; for the route of the Israelites, consult: Trumbull, *Kadesh-Barnea* (New York, 1884); Palmer, *The Desert of the Exodus* (Cambridge, 1871).

EXOG′AMY (from Gk. ἔξω, *exō,* outside + -γαμία, *-gamia,* from γάμος, *gamos,* marriage). Marriage outside of the clan, gens, or tribe, in contradistinction from endogamy, or mating within the group. In the earlier systematic studies of marriage, by McLennan, Spencer, and others, exogamy, or intertribal mating, was regarded as marking a relatively advanced stage of culture or social advancement. This view is partially sustained by later researches among Australian, American, and African natives. Among these and other primitive peoples, endogamy and exogamy are found to coexist in those remarkably definite customs out of which the common law and statute of higher sociology are developed. Commonly the clan (or maternal kinship group) or the gens (or patriarchal group) is an exogamous group. Marriage within the group is therefore regarded as incestuous and forbidden. At the same time the tribe or larger confederacy is an endogamous group, so that marriage within it is sanctioned, either generally or between particular clans, and marriage without is prohibited. In Australia, as well as in other primitive societies, the laws, which are, of course, expressed by custom alone, are of great complexity, and are crystallized in elaborate ceremonies, which have been described by Spencer and Gillen, Roth, and later observers. On the whole, it may be said that while endogamy and exogamy are coexistent and correlative in every stage of human development, the endogamous group is gradually reduced, and the exogamous group enlarged, with social advancement, so that the latter is more especially characteristic of the higher stages of civilization. See Man, Science of, paragraph on *Marriage.*

EX′OGEN (from Gk. ἔξω, *exō,* outside + -γενης, *-genes,* producing, from γίγνεσθαι, *gignesthai,* to become). An obsolete term, formerly applied to dicotyledons. See Dicotyledon.

EX′OGY′RA (Neo-Lat. nom. pl., from Gk. ἔξω, *exō,* outside + γῦρος, *gyros,* circle). A genus of fossil pelecypods of the oyster family (Ostreidæ), found in the rocks of Upper Jurassic and Cretaceous age. The shells are inequilateral, with only one muscle, and they resemble somewhat the form of the young plicate shells of the modern edible oyster, though they are larger and more convex and the beaks of their valves are spiral. The left or larger valve is deeply convex, often fixed by its apex, and is usually strongly ornamented by radial folds of the surface, and sometimes also by imbricating plates. The right valve is flat or concave and operculum-like, with a surface that is either smooth or marked by faint radiating lines. Exogyra costata of Say, with a length of three to eight inches, is very abundant in certain beds of the Cretaceous system of the Atlantic and Gulf coastal plain. See Oyster.

EXONERATION (Lat. *exoneratio,* from *exonerare,* to unload, from *ex,* out + *onerare,* to load, from *onus,* load). In its broadest sense, the act of discharging or the state of being discharged from some liability or obligation. A person who has become bail for another may entitle himself to exoneration by surrendering his principal. At common law, the devisee of lands which were subject to a mortgage given by his devisor, or the heir of such person upon inheriting the lands, was entitled to have the land exonerated from the mortgage debt—that is, to have that debt paid out of the personal estate of the mortgagor. This rule has been changed in England and in many of our States by statutes. At present the term is most frequently applied to the right of a surety to call upon the principal debtor to pay the guaranteed debt, and thus relieve the surety from his liability thereupon. This right accrues as soon as the surety is put in danger of being compelled to pay his principal's debt. If the creditor will not proceed against the principal, the surety may file his bill in equity for the purpose of compelling the principal to satisfy the debt, it being unreasonable that a surety should always have such a cloud hanging over him. Consult: Williams, *Principles of the Law of Real Property* (London and Boston, 1894); Redfield, *Law and Practice of Surrogate's Courts* (New York, 1894); De Colyar, *Treatise on the Law of Guarantees and of Principal and Surety* (London, 1900).

EX'OPHTHAL'MIC GOITRE, goi'tẽr. See Basedow's Disease.

EX'ORCISM (Lat. *exorcismus*, from Gk. ἐξορκισμός, *exorkismos*, exorcism, from ἐξορκίζειν, *exorkizein*, to administer an oath, from ἐξ, *ex*, out + ὁρκίζειν, *horkizein*, ὁρκοῦν, *horkoun*, to administer an oath, from ὅρκος, *horkos*, oath). The act of conjuring evil spirits, in the name of God, to depart out of the person possessed. The first Christians adjured evil spirits in the name of Jesus Christ; but as the opinion was entertained that all idolaters belonged to the kingdom of Satan, it was customary to exorcise heathens previous to their receiving Christian baptism; and since, on the theory of original sin, all infants were regarded as belonging to Satan's kingdom, exorcism became general at the baptism even of Christian children.

Of its exercise in the early Church, both in relation to energumens (q.v.) or persons possessed, and in the administration of baptism, there are numerous examples. Tertullian and Origen speak of it as of ordinary occurrence, and the Council of Carthage, in 255, alludes to its use in baptism. The rite of exorcism is used by the modern Church in three different cases: in the case of actual or supposed demoniacal possession, in the administration of baptism, and in the blessing of the chrism or holy oil, and of holy water, with the view of withdrawing from the influence of Satan creatures which are to be used in the service of God. Its use in cases of possession is now extremely rare, and in many dioceses is prohibited, unless with the special permission of the bishop. In baptism it precedes the ceremony of applying the water with the baptismal form. It is used equally in infant and in adult baptism, and Roman Catholic writers appeal to the earliest examples of the administration of the sacrament as evidence of the use of exorcism in both alike. The rite of baptismal exorcism in the Roman Catholic Church follows closely the scriptural model in Mark viii. 33. The exorcisms in the blessing of the oil and water resemble very closely the baptismal form, but are more diffuse. See Demoniac.

EXORCIST. A title of the second of the minor orders of the Roman Catholic Church. Down to the middle of the third century the power of exorcism (q.v.) was exercised by Christians generally, without special authorization. Pope Fabian (236-50) seems to have been the first to assign a definite name and functions to exorcists as a separate order. These functions may now be exercised by any priest, since he is ordained exorcist on his way to the priesthood; but in many dioceses the special permission of the bishop is required for their solemn exercise. See Orders, Holy.

EX'OSTEM'MA (Neo-Lat., from Gk. ἔξω, *exō*, outside + στέμμα, *stemma*, garland). A genus of American trees and shrubs of the natural order Rubiaceæ, nearly allied to Cinchona. Several species yield febrifugal barks, which, however, do not contain the cinchona alkaloids. The most valued of these are Caribbee bark and Saint Lucia bark, the latter of which is the produce of *Exostemma florisbundum*, a native of the more mountainous parts of the West Indies.

EX'OSTO'SIS (Neo-Lat., from Gk. ἐξ, *ex*, out + ὀστέον, *osteon*, bone). A bony tumor growing from some of the osseous structures of the body. See Tumor.

EX'OTER'IC. See Esoteric.

EXPANSION. See Heat.

EXPANSION (as a political term). See United States; United States, Extension of the Territory of the.

EX PARTE (Lat., from a part). From or on behalf of a designated party. The term is frequently used in the title of a legal proceeding. For example, if Shand is adjudged bankrupt the title of the bankruptcy proceedings is *In re Shand;* and if a creditor named Corbett makes an application in the cause for an order or determination in his behalf, his proceeding is entitled, *Ex parte Corbett in re Shand.* So if Smith applies for leave to sue an official bond, or for some particular writ (q.v.), this preliminary proceeding is entitled *Ex parte Smith.* The term is also used to describe the application or proceeding itself. Statements made in a judicial proceeding under such circumstances that the opposite party has no opportunity to challenge their accuracy are often spoken of as *ex parte.*

EXPATRIATION (from ML. *expatriare*, to banish from one's country, from Lat. *ex*, out + *patria*, father-land, from *pater*, father). Change of residence and allegiance from one's native or adopted land to another country and government, arising by voluntary act or by operation of law. It has been declared by the United States Congress to be "a natural and inherent right of all people, indispensable to the enjoyment of the rights of life, liberty, and pursuit of happiness." (*United States Revised Statutes*, 1999, 2000.) In the same statute Congress characterized every opinion, order, or decision which denied, restricted, impaired, or questioned the right of expatriation, as inconsistent with the fundamental principles of the Republic. These statutory declarations fairly represent the view now prevailing in this country. In the War of

1812 Great Britain denied the right of expatriation to her citizens, holding that they could not renounce their native allegiance and assume a new one without her consent. This doctrine was accepted by Chancellor Kent as in accord with the principles of the common law. It no longer obtains, however, either in this country or in Great Britain. In 1870 an act of Parliament and a treaty with the United States committed the British Government to an acceptance of the rule contended for by her opponent in the War of 1812. Under this statute and treaty any British subject who at any time may become naturalized in a foreign State shall be deemed to have ceased to be a British subject, and shall be regarded as an alien. Provision is also made for a formal declaration of allegiance by a person who is a British subject according to British law, but a foreign subject according to foreign law. It is further declared that a British woman by marriage with a subject of a foreign State is expatriated, and that a minor child changes its nationality with the expatriation of its father or widowed mother, provided it resides abroad with such parent.

In this country, an American woman is not expatriated by marriage with a foreigner unless she removes from the country with him. Actual departure from the United States is deemed an essential element in expatriation. While our legislation and national policy are favorable to expatriation, our Government will not undertake to protect persons who have secured naturalization here for the purpose of evading some duty to their native State, and not with the bona fide intent to transfer their residence and allegiance to us. Such persons are usually excepted from the operation of treaties which we have entered into with the principal States of Europe, conceding the right of expatriation to their subjects who have emigrated to this country. Consult the articles on ALIEN; LAW; NATURALIZATION; and the authorities referred to under those titles.

EXPECTATION (Lat. *expectatio*, from *expectare*, to expect, from *ex*, out + *spectare*, to behold, from *spicere*, to look). Like belief (q.v.), this term must be treated by psychology under two headings: as a complex mental process, characteristic of certain consciousnesses, and as a state of consciousness itself. (See ATTENTION.) (1) There is general agreement upon the point that expectation, regarded as an item of concrete experience, must be classed among the emotions. The analysis offered by the different psychologies differs, however, according as the author recognizes two or more than two qualities of affection (q.v.). If we believe that pleasantness and unpleasantness are the sole affective qualities, we may say that expectation is a collective term, including both hope (pleasant expectation) and fear (unpleasant expectation); just as surprise is a collective term, including the emotions of pleased and of unpleasant surprise. (See EMOTION.) Or we may do as, e.g. Külpe does—assume the existence of two types of emotion: one characterized by the predominance of an affective quality, the other by that of a peculiar complex of organic sensations. This supposition seems, however, rather to cut than to meet the difficulty. If, on the other hand, we posit a large number of affective qualities, we can base expectation upon the quality of tension, as we base joy upon that of pleasantness. "Feelings of tension and relaxation," says Wundt, "are always connected with the temporal course of processes. Thus, in expecting a sense impression, we note a feeling of tension, and, on the arrival of the expected event, a feeling of relaxation. Both the expectation and the satisfaction may be accompanied, at the same time, by a feeling of excitement, or, under special conditions, by pleasurable or unpleasurable feelings. These other feelings may, however, be entirely absent." Wundt thus admits the possibility of an indifferent (neither hopeful nor anxious) expectation, which shall be simply tense or strained. In the present unsettled condition of affective psychology, it is unwise to make a choice between these two conflicting views; judgment must be reserved until such time as the emotive processes have been brought under experimental control.

(2) Considered as a state of consciousness, expectation may be defined as an anticipatory or preparatory attention. In expecting an impression, we set ourselves for its reception; partly by the proper adjustment of the sense-organ to which the impression will appeal; partly by imaging the occurrence, forming an idea of it; partly by taking up an appropriate bodily attitude, and so securing the most favorable background of organic sensations; partly, it may be, by rehearsing, mentally, the judgment that we shall pass upon the event when it takes place. It is clear, from this analysis, that a suitable direction of expectation is the *sine qua non* of a full apprehension or clear apperception of the impression. Hence it is customary, in all forms of psychological experimentation, to give a signal (a spoken 'Now!' or the stroke of an electric bell) to the observer, at such an interval before the presentation of stimulus that expectation may just have time to reach its maximum, without passing over into fatigue. The time required, at least in the simpler departments of experimental work, amounts to 1.5 or 2 seconds. During this period, the observer has an opportunity to concentrate himself upon the problem in hand, either in a general way, by banishing irrelevant ideas and thoughts, or, more specifically, by calling up a definite mental image of the coming stimulus. Suppose, e.g. that the two points of a pair of compasses are to be set down simultaneously upon the skin of the wrist, at a certain distance apart, and that the observer is to say whether he senses one or two pressures. On hearing the ready-signal, he will (a) devote his attention exclusively to the wrist, and purposely ignore any accidental stimulation of eye or ear; while (b) if he has had previous experience in the discrimination of two points upon the skin, he will represent to himself, in terms of pressure sensation, the various forms that cutaneous 'twoness' may take.

Expectation, then, if rightly directed, is of essential service to the experimental psychologist. But the predisposition of consciousness may be a source of error, as well as a help, in laboratory work. Suppose that we wish to ascertain the least separation of the compass points that can evoke the introspective response 'two pressures.' We shall begin with a separation of the points at which only one pressure is sensed, and gradually increase this separation, in successive trials, until the judgment 'one' passes over into the judgment 'two.' We secure the observer's full attention, at each application of the instrument, by means of our ready-signal. Since, however, we are making a series of tests, and the series is progressing in a known direction (from oneness toward twoness), the observer can hardly remain unprejudiced; at each fresh step of the series he will think, "*This* time there must be two!" The judgment 'two' will, therefore, come too soon; our result is vitiated by the error of expectation. In all such cases some method must be devised whereby this error may be eliminated. In the present instance we eliminate it, very simply, by reversing our series. We begin a second set of tests with a separation of the compass points that gives two clear pressures, and work down, step by step, until 'two' passes over into 'one.' The 'one' comes as much too soon, in this reversed series, as the 'two' came too soon in the preceding series. By averaging the results of the two series, we rule out the expectation error.

Consult: Wundt, *Outlines of Psychology* (Eng. trans., Leipzig, 1898); Külpe, *Outlines of Psychology* (Eng. trans., London, 1895); Titchener, *Primer of Psychology* (New York, 1900); id., *Experimental Psychology* (New York, 1901). See FATIGUE; HABIT; PRACTICE; PSYCHOPHYSICS.

EXPECTATION WEEK. A name sometimes given to the period between Ascension Day and Whitsunday, because during this time the Apostles continued praying in earnest expectation of the Comforter.

EXPECTORANT (from Lat. *expectorare*, to drive from the breast, from *ex*, out + *pectus*, breast). Any medicine given to carry off the secretions of the respiratory tract. (See BRONCHUS; BRONCHITIS.) The principal expectorants are antimony, squill, ipecacuanha, senega, balsam of tolu, lobelia, gum ammoniac, asafœtida, and galbanum.

EXPECTORATION. The act of spitting; also the *sputum*, which is the Latin name for the mucus or other secretion discharged from the air-passages. The examination of expectoration is of the utmost value in the diagnosis of diseases of the chest. Often the nature of an ailment can be determined or the diagnosis confirmed by the examination of the expectoration. In simple bronchitis the sputum is frothy and colorless, and floats on water. In chronic bronchitis it is generally yellowish or greenish, and, owing to an admixture of pus, it sinks in water. If the sputum be tinged with dark blood, pneumonia is suspected. In tuberculosis of the lungs bright blood may be coughed up, or mucus of a very pink tint from the coloring matter of blood, or the sputum may be very abundant, viscid, greenish, and partially submerged in water. It may be offensive in odor during tuberculosis, and is always so during gangrene of the lung. But the diagnosis does not rest on the appearance of the sputum or the examination of the chest. Methods of staining certain elements and the use of the microscope will decide upon the presence or absence of the tubercular bacillus; Pfeiffer's bacillus, of *la grippe;* the pneumococcus and the pneumobacillus, of pneumonia; streptococcus, of pus infection; or other bacilli, as well as elastic fibres from the lung. In certain cases expectoration of mucus is to be encouraged, and cough must not be checked. In all cases of known or suspected communicable disease, as influenza (*la grippe*), pneumonia, or tuberculosis, sputum must be received in a vessel in which it is kept moist till it is destroyed by disinfection with a 1 to 40 solution of carbolic acid; or, better, received in a paper spit-cup which is burned before it is dry. Carpets, furniture, and bedding should be protected from expectoration in these cases of disease, and sheets, pillow-cases, handkerchiefs, napkins, and night clothing should be frequently changed and dipped in boiling water before being washed.

EX PE'DE HER'CULEM (Lat., Hercules from his foot). A Latin proverb, meaning that the whole can be tested by a part. The saying is assigned to Pythagoras, and is paralleled by another similar phrase, *ex ungue leonem*, 'You can judge of a lion by his claw.'

EXPERIENCE MEETING. A name applied to religious gatherings at which one or more of those present set forth their spiritual history and experiences. In the Methodist Church they are called class-meetings, and among some other denominations covenant or conference meetings. The ordinary prayer-meeting of a church sometimes takes this form. Such passages as Mal. iii. 16 and Col. iii. 16 are quoted in defense of meetings of this kind.

EXPERIMENTAL PSYCHOLOGY. See PSYCHOLOGY, EXPERIMENTAL.

EXPERT (Lat. *expertus*, skilled, p.p. of *experiri*, to test). One who is specially experienced in a particular subject-matter of inquiry, as the result of previous habit or practice or study. From the legal point of view, the most important function of the expert is that of witness in litigated cases.

The earliest recorded appearance of the expert in English judicial tribunals was in the capacity of an adviser of the court. As early as 1353 we are told that, in an appeal of mayhem, the sheriff was ordered to summon skillful surgeons from London to inform the court whether the wound in question was mayhem or not. In the seventeenth century it became customary to call experts as helpers of the jury. When acting in this capacity they were sworn and examined by counsel as witnesses. At the trial of the Suffolk witches, in 1665, Sir Thomas Browne, the physician and natural philosopher, testified, after examining the accused, that he was of the opinion that they were bewitched. From that time the medical expert has been an important figure in criminal trials. But expert testimony is not confined to members of the learned profession. It may be given by farmers, mechanics, brokers, lumbermen, physicians, clergymen, scientists, lawyers, or any person qualified by special training and knowledge to answer questions requiring such training and knowledge to answer them. (See EVIDENCE.) When the case is before a court and jury, it is for the court to say whether the questions call for expert assistance, as well as whether a particular witness is justified to speak as an expert thereon. It is for the jury to determine the worth of an expert opinion, after it has been given. Such opinion (however famous or learned or experienced the one who utters it may be) is not binding upon the jury. It may be accepted as helpful, or it may be totally disregarded. At times the expert deposes to facts rather than opinions; as when a chemist explains the examination of an alleged blood-stain, or of parts of a human body.

When his opinion is called for, it is ordinarily based upon a hypothetical question—that is, a question which supposes the statements of fact contained in it to have been established by competent evidence. Assuming the facts to be as stated in the question, the expert is asked to tell the jury what, in his opinion, is the correct inference to be drawn from them. It will be observed, therefore, that he is not asked to invade the province of the jury and decide the general question at issue, but only to testify to the specific inference that should be drawn from particular facts.

Whether a person can be compelled to attend and testify as an expert for the fees of an ordinary witness is a question upon which the authorities are conflicting. In England and in many of our States it has been aswered in the negative, either by judicial decision or by statute. This view is based upon two considerations: First, that to compel a person to attend as a witness merely because he is accomplished in a particular science, art, or profession would subject the same individual to be called upon in every cause where his opinion would carry weight. Second, that a person's special knowledge and skill are property, which should be no more at the mercy of the public than the goods of the merchant, or the crops of the farmer. On the other hand, the view is maintained that the law allows no excuse for withholding evidence, and that the expert witness, in the performance of his duty as a good citizen, should be compelled to testify where his evidence would be helpful to a court or jury, whether that evidence be based upon personal observation of some fact connected with the case, or upon his accumulated knowledge and experience. It is generally agreed, however, that an expert cannot be required to make any special preparation or investigation for the opinion he is supposed to give, without extra compensation.

The usefulness of expert evidence, and the advisability of changing the present methods of procuring and presenting it, are also questions upon which widely different views are entertained. A recent writer upon this subject, a lawyer of high reputation and sound judgment, has declared that "few judges have a good word to say for expert testimony." Lord Campbell once told the House of Lords that expert witnesses "come with a bias on their minds to support the cause in which they are embarked, and hardly any weight should be given to their evidence." Quite recently a learned judge in New York City advised the jury "to put all the expert testimony out of their minds, and pay no attention to it." This he did although a week had been consumed in taking the expert testimony, because "an equal number of doctors has testified directly opposite to each other, and all with equal positiveness." On the other hand, the present system has its strong advocates, and no radical change is to be expected in the near future. Consult: Rogers, *Law of Expert Testimony* (Saint Louis, 1891); Lawson, *Law of Expert and Opinion Evidence* (2d ed., Chicago, 1900); Foster, "Expert Testimony, Prevalent Complaints, and Proposed Remedies" (11 *Harvard Law Review*, 169); Endlich, "Proposed Changes in the Law of Expert Testimony" (32 *American Law Review*, 851). See EVIDENCE.

EXPIATION, DAY OF. See ATONEMENT, DAY OF.

EXPLANATION (Lat. *explanatio*, from *explanare*, to explain, from *ex*, out + *planare*, to level, from *planus*, plain). In science, the giving of a complete description of some object or event. In certain cases this end is attained by the subsumption of the phenomenon to a general law, as when a physical fact is brought under one or other of the general laws of mechanics. The law, in such instances, is mathematically exact; it sums up in shorthand all the conditions under which the phenomenon in question appears; it sets the phenomenon in its right place within the causal nexus of the material universe. In fields of science that are less 'exact' than physics, such as biology and psychology, explanation takes on a different form. The laws of these sciences are, for the most part, hypothetical generalizations or supplementings of the facts more or less hypothetical in character, rather than shorthand formulæ derived from the facts themselves; so that subsumption to them, while it may help to confirm a theory or to classify an otherwise heterogeneous subject-matter, does not constitute explanation. Nothing is more erroneous than the popular belief that a given fact is adequately explained when it is referred to a 'principle' of heredity or of memory. Explanation consists rather in an accurate description of the fact as observed, together with a statement, as full as the circumstances permit, of the proximate conditions under which it appears. Thus a fact of mind, a complex mental process, is explained when we have (1) analyzed it into its elements, sensation and affection, and (2) referred these constituent processes to their proximate physical conditions in the cerebral cortex. To explain, e.g. an impulse as a 'manifestation of our active nature' or of a 'faculty of will'; or to account for the rise of an idea in consciousness by a 'law of telepathy,' is to interpret a fact, a scientific datum, which can be known, in terms of the less known and hypothetical. Misunderstandings of this sort have recently called forth emphatic protest from men of eminence in scientific inquiry. 'The business of all science is the description of facts'; and when a scientific 'theory' goes beyond the specification of the conditions under which the facts are observable, it ceases to be an aid to thought and becomes a positive hindrance. Consult: Külpe, *Outlines of Psychology* (Eng. trans. London, 1895); id., *Introduction to Philosophy* (Eng. trans. New York, 1897); Mach, *Contributions to the Analysis of the Sensations* (Eng. trans. Chicago, 1897); *Popular Scientific Lectures* (Eng. trans. Chicago, 1895).

EXPLOITS RIVER. A large river in Newfoundland, rising in the southwest part of the island, which it almost bisects (Map: Newfoundland, E 4). It takes a northeasterly course through the extensive Red Indian Lake and flows into the Bay of Exploits on the northeast coast. The fertile but sparsely settled valley abounds with game, and the river with fish. It is navigable for 12 miles from its mouth by steamers, and small boats ascend within 50 miles of the southwest coast.

EXPLOSION. See BALLISTICS.

EXPLOSIVES (from Lat. *explosus*, p.p. of *explodere*, to explode, from *ex*, out + *plaudere*, to clap). Substances, either solid or liquid, which, under the influence of some disturbing agency, enter into a chemical reaction accompanied by the production of gases and the evolution of much heat.

History. Nothing definite is known about the origin of explosives, and it is contended by some that the invention of gunpowder was contemporaneous with the discovery of saltpetre. Greek fire, which is believed to have been a preparation of pitch, resin, saltpetre, and sulphur, was first used during the defense of Constantinople about 660, and it is reasonable to believe that gunpowder was a development of this mixture. Manuscripts are in existence showing the use of gunpowder among the Arabs prior to 1250, but its discovery is generally attributed to Roger Bacon, of Oxford, England, who mentioned it about 1270, and to Berthold Schwartz, of Freiberg, Germany, who described it in 1328. Its discovery has also been attributed to the Chinese, and a description of its use at the siege of Pian-king and Lo-yang in 1232 is contained in the Chinese Annals, and its invention has been ascribed to the Hindus in consequence of certain passages in Indian law books, but the authenticity of these Oriental descriptions is doubted by modern writers. In 1346 at the battle of Crécy use was made of cannon (see Artillery; and Ordnance) in which gunpowder was employed as a propellant, and its use increased with the subsequent development of firearms, though it remained practically the same until the last century. (See Gunpowder.) In 1845 Schönbein, of Basel, discovered the explosive nature of guncotton, and in 1847 Sobrero discovered nitroglycerin (q.v.). Alfred Nobel invented dynamite (q.v.) in 1836, and to him also is due the production in 1875 of blasting gelatin. The explosive character of nitrated hydrocarbons was indicated by Hermann Sprengel in 1873, and in 1887 it was still further developed by Eugene Turpin, while the now important smokeless powders should be credited to the inventive genius of Vieille, who was the first, in 1886, to produce a really successful military smokeless powder, though previous investigators had been active in this field and had achieved varying degrees of success. See Smokeless Powder.

Classification. Explosives are either mechanical mixtures or chemical compounds. The first class consist of certain chemical substances intimately mixed by mechanical means, which, at an elevated temperature, react upon each other and pass into the gaseous state, causing the explosion. Typical of this class is gunpowder. Another example of this class is a mixture of finely divided charcoal and liquid air. A mixture of acetylene and ozone in the liquid state, if it were employed, would constitute one of the most powerful explosives of the same class. A typical example of the second class of explosives is nitroglycerin. Other examples of the second class are liquid acetylene and liquid ozone. The further subdivisions of the two classes of explosives include the following groups: Explosive mixtures of the nitrates, explosive mixtures of the chlorates, explosive compounds derived by nitro-substitution, explosive compounds of nitric derivatives, the Sprengel explosives, and fulminates and amides.

Theory of Explosions. An explosion may be defined as a chemical reaction which is effected in an exceedingly short space of time with the evolution of a large quantity of gas at a high temperature and accompanied by a shock. When this reaction occurs in a body which is confined, the expansive action of the heated gases produces disruptive effects. The force which is developed by the passage from the solid form to the gaseous condition depends upon the ingredients of the explosive. When the explosion is progressive, that is, starts at an initial point and continues from one group of particles to the next, and so on through the explosive, the action is termed *burning* and is analogous to ordinary combustion. When, however, the combustion is effected simultaneously throughout the mass in an extremely short space of time, the action is called *detonation*. The development of an explosion may often be explained as resulting from the transformation of a shock into heat. This may be accomplished by the propagation of the shock from particle to particle in an explosive, or by a shock from one explosive body to another not in direct contact. The latter is the synchronous vibratory theory of Sir Frederick A. Abel, who claims that the originating cause of the detonation of an explosive lies in the synchronism between the vibrations produced by the body that provokes the detonation and those that the first body would produce in detonation, just as the string of a musical instrument resounds at a distance in unison with another vibrating cord. Marcellin P. E. Berthelot, on the other hand, contends that an explosion is due to the transformation of mechanical energy into heat, which, during the explosion, is again transformed into mechanical energy; that is to say, it is dependent upon the production of two orders of waves, one series of which represents the explosive waves developed in the midst of the matter that detonates, and consists of a continually reproduced transformation of the chemical actions into thermal and mechanical actions which transmit equally the sudden pressure all around the centre of the concussion to the adjoining bodies and thence to a new mass of explosive material. Most explosives consist essentially of compounds containing carbon, oxygen, and nitrogen, the last of which is in a state of feeble combination with the whole or part of the oxygen, thus constituting an unstable chemical condition, which is necessary. When the explosion takes place the nitrogen gives up its oxygen to the carbon, for which it has a greater affinity, forming carbon dioxide and carbon monoxide gases, the combination being attended by great generation of heat, and the nitrogen is set free. In most explosives the carbon is accompanied by hydrogen, which, by its combustion, produces an extremely high temperature and combines with a part of the oxygen to form water in the state of greatly expanded vapor. Other subordinate elements are often present; thus, for instance, in gunpowder the potassium holds the nitrogen and oxygen loosely together as saltpetre, and there is sulphur, a second combustible whose oxidation evolves even greater heat than carbon. When potassium chlorate is present the chlorine acts the same as the nitrogen, and is set free in the gaseous state. The foregoing description illustrates those explosives in which the decomposition may be considered a process of oxidation, but there are cases in which an explosion occurs by the simple dissociation of a compound without oxidation; thus, nitrogen chloride and nitrogen iodide contain neither carbon nor oxygen, and their great explosive violence is explained by the feeble affinities of nitrogen for other elements.

EXPLOSIVE MIXTURES OF THE NITRATES. This class consists of those compounds which are mechanical mixtures of nitrates with some base, and contain charcoal or other substance yielding carbon, also usually containing sulphur. The nitrates are the source of the oxygen which on explosion combines with the carbon of the charcoal, producing large volumes of gases, so that the mixture when confined will at the time of explosion be accompanied by a violent disrupting action. The typical representative of this class is black gunpowder, for a description of the manufacture of which, see GUNPOWDER. The standard composition of gunpowder is potassium nitrate (saltpetre) 75 parts, charcoal 15 parts, and sulphur 10 parts; although these ingredients necessarily vary according to the uses for which the powder is desired; that is, whether for blasting, sporting, or warfare. They must also be combined so that (1) the combustion may be complete and little residue left after explosion; (2) that the powder should not readily absorb or retain moisture; (3) that its explosive properties should not be greater than required; and (4) it should be hard and dense enough to bear transportation without disintegrating. Excess of carbon and sulphur prevents perfect combustion and lowers the explosive force, while too great an amount of potassium or sodium chloride in the saltpetre will make the powder hygrometric. Disintegration may be prevented by proper stamping. Good gunpowder should have a density between 1.5 and 1.85, and the most powerful powders are those that are the most dense. Its exploding point ranges from 270° C. for blasting-powder, 275° C. for rifle-powder, and 315° C. for the best sporting-powder.

Among the more important explosive compounds in this class may be mentioned the following: *Amide powder,* consisting of a mixture of ammonium and potassium nitrates with charcoal; *azotine,* consisting of sodium nitrate 69.04 parts, carbon 15.23 parts, sulphur 11.43 parts, and petroleum, 4.29 parts; *carbo-azotine,* consisting of potassium nitrate 61.04 parts, ferrous sulphate 13.58 parts, soot 24.65 parts, and sulphur 13.58 parts; *diorexine,* consisting of potassium nitrate 50 parts, sodium nitrate 25 parts, sulphur 12 parts, and sawdust from hard wood 13 parts; *johnite,* consisting of potassium nitrate 75 parts, sulphur 10 parts, lignite 19 parts, sodium picrate 3 parts, and potassium chlorate 2 parts; *petralite,* consisting of potassium nitrate 64 parts, impregnated wood or charcoal 30 parts, crude antimony 6 parts; *pyrolite,* consisting of potassium nitrate 51.50 parts, sodium nitrate 16 parts, sulphur 20 parts, sawdust 11 parts, and charcoal 1.50 parts; and *saxifragine,* or *poudre barytique,* a mixture of barium nitrate and charcoal with a small portion of potassium nitrate.

EXPLOSIVE MIXTURES OF THE CHLORATES. On account of the readiness with which potassium chlorate lends itself to the production of powerful explosives, it has been frequently used by inventors to produce explosive mixtures. It will combine with almost any carbonaceous material, and will readily explode by friction. The tendency of such mixtures to spontaneous ignition, as well as their sensitiveness to percussion, has prevented their extensive adoption. Among the mixtures in this class that may be mentioned are the following: *Asphaline,* consisting of potassium chlorate 54 parts, potassium nitrate and sulphate 4 parts, mixed with bran 42 parts; *Ehrhardt powder,* consisting of a mixture of tannin, powdered nutgalls, or cream of tartar, with potassium chlorate; *Fontaine powder,* consisting of a mixture of potassium chlorate and potassium picrate; *Horseley powder,* consisting of potassium chlorate 6 parts, nutgalls 1 part, and charcoal 1 part, mixed with 72 parts of nitroglycerin (this may also be classed as a dynamite); *Kellow safety powder,* consisting of spent tan and sawdust saturated with potassium or sodium nitrate and a little potassium chlorate, and then mixed with sulphur; *Michalowoski blasting-powder,* consisting of potassium chlorate 50 parts, manganese dioxide 5 parts, and finely pulverized organic matter, as bran, 45 parts; *Oriental powder,* consisting of potassium nitrate and crude gamboge mixed with potassium chlorate; *pyronome,* consisting of potassium nitrate 69 parts, sulphur 9 parts, charcoal 10 parts, metallic antimony 8 parts, potassium chlorate 5 parts, rye flour 4 parts, and a small quantity of potassium chromate; *raekarock,* consisting of potassium chlorate 79 parts, and mono-nitrobenzine 21 parts, which are prepared separately and combined only when about to be used; *tutonite,* consisting of potassium chlorate mixed with sulphur and metallic sulphides; and *white powder,* consisting of a mixture of sugar, potassium ferrocyanide, and potassium chlorate.

EXPLOSIVE COMPOUNDS DERIVED BY NITRO-SUBSTITUTION. This class consists of a series of compounds that are formed by treating certain hydrocarbons of the aromatic series, which are for the most part coal-tar products, with nitric acid; producing a new chemical compound which is relatively unstable, and contains elements that are capable of uniting at a high temperature to form stable gases. These explosives accomplish their purpose by a dissociation of the constituent elements of the compound, which then recombine into a variety of gaseous compounds. These explosives are sometimes called 'safety explosives,' and have considerable economic value, especially for blasting purposes, largely owing to the fact that they do not give off fumes of poisonous gases, and have a high rending or expansive force. Among representative members of this class may be mentioned the following: *Ammonites* or *Favier explosives,* consisting of ammonium nitrate 88 parts, mixed into 12 parts of melted di-nitronaphthalene; *bellite,* consisting of ammonium nitrate 5 parts, and meta-di-nitrobenzine 1 part, melted together, and potassium nitrate stirred into the mixture; *Borlinetto powder,* consisting of picric acid 10 parts, sodium nitrate 10 parts, and potassium chromate 8½ parts; *extralite,* consisting of a mixture of ammonium nitrate, potassium chlorate, and naphthalene; *joveite,* consisting of varying proportions of nitro-naphthalene (8 to 6 parts), nitro-phenol (16 to 30 parts), and sodium nitrate (76 to 64 parts); *roburite,* consisting of a mixture of ammonium nitrate and well purified chlorinated di-nitrobenzine; *romite,* consisting of a mixture of ammonium nitrate, potassium chlorate, and naphthalene; *securite,* consisting of a mixture of ammonium nitrate and di-nitrobenzine; and *Volney powder,* consisting of potassium nitrate, sulphur, and nitro-naphthalene. Many of these explosives pass into the Sprengel class.

Explosive Compounds of the Nitric Derivatives. This group of explosives consists of nitric derivatives either of cellulose or gelatin. In the first case the cellulose is treated with nitric acid, forming *guncotton*, and in the second case glycerin yields, by the action of nitric acid, *nitroglycerin*. According to the proportions used the mono-, di-, or tri-nitro derivatives of glycerin or a multiple of them for cellulose may be obtained. This class is by far the largest one, and too numerous to admit of a general description, in consequence of which the peculiar properties of each will be found described under their special headings.

Guncotton is an important member of this class. It consists of cellulose such as pure cotton treated with nitric acid, although in actual practice the best results are obtained from a mixture of nitric acid and sulphuric acid. It is employed chiefly for military purposes and is regarded as the safest explosive known. (See Guncotton.) Among the various guncotton preparations, which differ from each other only by the proportions of their ingredients and methods of preparation, are the following, which are now seldom used, although valuable on account of their safety: *Glyoxiline*, a guncotton pulp which is mixed with potassium nitrate, converted into porous pellets which are saturated with nitroglycerin and afterwards coated with varnish to protect them from moisture; *potentite*, a mixture of 62.2 parts guncotton and 33.8 parts potassium nitrate compressed into cartridges; *tonite* or *cotton powder*, a preparation consisting of 52.5 parts of finely divided or macerated guncotton with 47.5 parts of barium nitrate, which are made up into cartridges coated with paraffined paper.

The value of guncotton as an explosive led to its adoption for use in the manufacture of *blasting-gelatin*, invented by Nobel in 1875, which is accomplished by dissolving the soluble variety of guncotton in nitroglycerin. This has been made up variously, and also combined with absorbents, forming *gelatin dynamites*, which have been largely used for blasting purposes, notably in the case of the Saint Gotthard tunnel. In this class should be included *forcite*, consisting of blasting-gelatin (nitroglycerin 98 parts, collodion cotton 2 parts), 50 parts, and absorbent (sodium nitrate 76 parts, sulphur 3 parts, wood tar 20 parts, wood pulp 1 part), 50 parts; and *gelignite*, consisting of blasting-gelatin (nitroglycerin 96 parts, collodion cotton 4 parts) 65 parts, and absorbent (sodium nitrate 75 parts, sodium carbonate 1 part, wood pulp 24 parts), 35 parts.

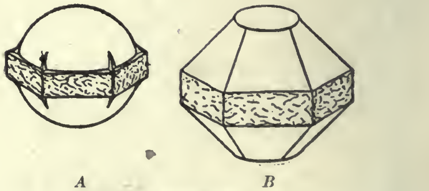
Smokeless Powders represent the latest development of explosives containing guncotton, and consist chiefly of either a guncotton which, by the aid of a solvent, has been converted into a colloid mass which, when dried, is a hard horn-like material, which may then be formed into flakes or cords, or of a powder in which a mixture of guncotton and nitroglycerin is transformed into a similar horn-like substance either with or without the aid of a solvent. In the first class are the *Bernadou powder*, consisting of a nitrocellulose brought into the colloid condition by treating with ether-alcohol and acetone; *poudre B* of Vieille, used in France, and consisting of guncotton mixed with barium nitrate, potassium nitrate, and sodium carbonate, and treated with either ether-alcohol, ethyl acetate, or acetone; and *Wetteren powder*, used in Germany, and consisting of nitro-cotton 48.15 parts, guncotton 30.73 parts, charcoal 12.12 parts, volatile matter 8.22 parts, and humus 0.77 part. The foregoing are typical of the military smokeless powders. Sporting powders of similar character are now made, in which the process of manufacture and the proportions of the ingredients are changed to produce the desired results. Of the second class, the most important are: *Amberite*, consisting of tri-nitrocellulose 44 parts, di-nitrocellulose 12 parts, and nitroglycerin 40 parts, formed into grains and treated with solvent, consisting of sulphuric ether with a little alcohol; *ballistite*, consisting of guncotton 40 parts, dissolved in nitroglycerin 60 parts, to which a small quantity of aniline has been added as a neutralizing agent; *cordite*, consisting of nitroglycerin 58 parts, guncotton 37 parts, vaseline 5 parts, dissolved in 19.2 parts of acetone; *filite* is similar to ballistite and is used in Italy for military purposes. Certain varieties of smokeless powders consist of nitrocellulose combined with nitro-derivatives of aromatic hydrocarbons, and included in this class are *Du Pont powder*, consisting of nitrocellulose brought into the colloid condition by nitro-benzine or other soluble solvent; and *indurite*, produced by treating highly nitrated cellulose with mono-nitrobenzine until it is brought into the colloid condition and then removing the collodizing agent. Both of the last-named powders are of American origin, and differ from each other in the method of manufacture and proportion of ingredients. See Smokeless Powders.

Nitroglycerin. This most powerful explosive was discovered by Ascanio Sobrero, in Turin, Italy, 1847, and is a colorless or light yellow oily liquid made by passing pure glycerin into a mixture of concentrated nitric acid and sulphuric acid which explodes violently at 180° C. Its tendency to decompose, resulting in violent explosion, has led to the abandonment of it as an explosive, but when combined with a suitable absorbent, this property is removed, and has given rise to a very important series of explosives known generically as *dynamites*, which may be again subdivided into two principal groups, namely, dynamites with an inert absorbent and dynamites with an active absorbent. The type of the first group is the original dynamite invented by Nobel in 1866, who used for his absorbent diatomaceous silica, siliceous marl, tripoli, or rotten-stone, commonly called kieselguhr. It is made of various degrees of strength, ranging from nitroglycerin 75 parts and absorbent 25 parts, down to nitroglycerin 30 parts and absorbent 70 parts. Other explosives of this class are *carbodynamite*, consisting of nitroglycerin 90 parts and charcoal made from cork 10 parts, and *cerberite*, consisting of nitroglycerin modified with wood tar and nitro-benzine with charcoal as an absorbent. The second group comprises those dynamites that are composed of nitroglycerin and an active absorbent, usually a nitrate mixture. The following are among the more important commercial dynamites of this group, the ingredients of which vary in amount according to the special purpose for which they are intended, so that the proportions mentioned are typical of only one variety: *Atlas powder,* consisting of nitroglycerin 75 parts, wood-fibre 21 parts, sodium nitrate 2 parts, magnesium carbonate 2 parts; *carbonite,* consisting of wood-meal 40½ parts, sodium nitrate 34 parts, nitroglycerin 25 parts, and sodium carbonate one-half part; *dualin,* consisting of nitroglycerin 40 parts, sawdust 30 parts, potassium nitrate 20 parts; *giant powder,* consisting of nitroglycerin 40 parts, sodium nitrate 40 parts, powdered resin 8 parts, kieselguhr 8 parts, sulphur 6 parts; *Hercules powder,* consisting of sodium nitrate 45 parts, nitroglycerin 40 parts, wood-pulp 11 parts, sodium chloride 1 part, and magnesium carbonate 1 part; *Judson powder,* consisting of sodium nitrate 64 parts, sulphur 16 parts, cannel coal 15 parts, nitroglycerin 5 parts; *lithofracteur,* consisting of nitroglycerin 54½ parts, kieselguhr 16¾ parts, barium nitrate 14¾ parts, sulphur 7 parts, manganese 2 parts, soda 2 parts, wood-meal 2 parts, bran 1 part; *meganite,* consisting of nitroglycerin 60 parts, sodium nitrate 20 parts, nitrated vegetable ivory 10 parts, nitrated wood 10 parts; *rhexite,* consisting of nitroglycerin 64 parts, sodium nitrate 18 parts, decayed wood 11 parts, wood-meal 7 parts; *safety nitro-powder,* consisting of nitroglycerin 68.81 parts, sodium nitrate 18.35 parts, wood-pulp 12.84 parts; *stonite,* consisting of nitroglycerin 68 parts, kieselguhr 20 parts, potassium nitrate 8 parts, and wood-meal 4 parts; *vigorite,* consisting of potassium chlorate 49 parts, nitroglycerin 68 parts, kieselguhr 20 parts, potassium nitrate 7 parts, magnesium carbonate, moisture, etc., 5 parts; and *Vulcan powder,* consisting of sodium nitrate 52.5 parts, nitroglycerin 30 parts, charcoal 10.5 parts, and sulphur 7 parts.

Sprengel Explosives or Panclastites. In 1873 Dr. Hermann Sprengel described a class of explosives consisting of two inexplosive ingredients, which, when mixed together, yielded a compound capable of violent detonation. The safety with which such explosives could be transported to the place of action led to their study by the experts on explosives of various governments, and a number of valuable preparations of this class have since been patented in different countries. A number of these have already been described, as *rackarock,* under Explosive Mixtures of the Chlorates, and *ammonites, bellite, roburite, romite,* and *securite* under Explosive Compounds Derived by Nitro-Substitution. In addition to these there should be mentioned *hellhoffite,* consisting of nitric acid with a specific gravity of 1.5, 53 parts, and meta-di-nitrobenzine 47 parts; and panclastite, consisting of nitro-tetroxide combined with some combustible substance, such as a hydrocarbon, vegetable, animal, and mineral oils, fats, and their derivatives, but preferably with carbon disulphide. In this class may be included the picric acid compounds, which consist of tri-nitrophenol or picric acid brought into a dense state by fusion, and used as a filler for shells. This explosive, differing only in the details of its manufacture, which are kept secret by the respective governments, is called *lyddite* in England and *melinite* in France. The *ecrasite* of the Austrian Government is made by substituting tri-nitrocresol for tri-nitrophenol (picric acid).

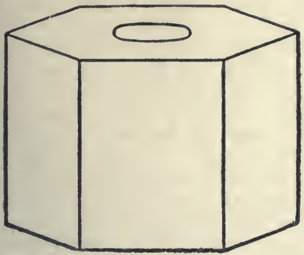
Fulminates and Amides. The fact that certain nitrates, when heated with alcohol and an excess of nitric acid, yield peculiar crystalline, easily detonating precipitates, has been known for more than a century, and this property has been taken advantage of in the preparation of explosives. The best-known member of this class is the *mercury fulminate,* which is made by dissolving mercury in nitric acid, to which solution when cool alcohol is added. The gray explosive mercury fulminate is thrown down by the addition of water. The precipitate is then carefully washed and air-dried. It is exceedingly sensitive to heat and shock of any kind, and may be detonated by heat at a temperature variously given from 149° C. to 200° C. The *silver fulminate,* which is formed by heating an aqueous solution of silver nitrate with strong nitric acid and alcohol, is of similar nature. Mercury fulminate finds an extensive application in detonators for guncotton and for nitroglycerin compounds; also for cap and detonating compositions. The *amides,* such as nitrogen chloride and nitrogen iodide, have been referred to under Theory of Explosives, and have no economic interest.

Military Uses of Explosives. The principal use of explosives is, of course, for military purposes, where they are employed as propelling and as bursting charges for projectiles. An explosive for use as a *propelling* charge in a gun should give in that gun as low maximum pressures and as high projectile velocity as possible. The older powders were finely pulverized. About 1860 and later, it was customary to press the powder after mixing into a cake, afterwards broken between rollers into irregular grains which were sorted by screens into different sizes, musket, mortar, cannon, and mammoth; the latter from 0.6 inch to 0.9 inch. At this date, 1860, General Rodman proposed cylindrical cakes, nearly the diameter of the bore and 3 inches long, pierced by ¼-inch holes ¾ inch apart, reasoning that the burning on the inner surfaces of these holes would give a constantly increasing surface, and therefore an increasing rate of generation of gas, a condition which he recognized to be desirable. At the time this form was not deemed preferable to the mammoth, and his principle was adopted only after a number of years, and was preceded by the use of other powders—as the sphero-hexagonal—molded simply for uniformity of size. His grain when adopted was modified to a hexagonal prism about 1 inch long and wide, pierced by one or several holes.

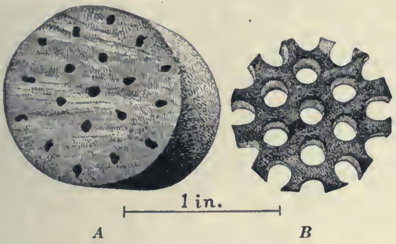


BLACK POWDER.
A—Sphero-hexagonal grain. *B*—Hexagonal grain.

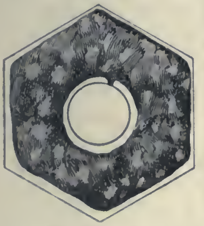
About 1882 the Germans introduced 'brown' or 'cocoa' powder in the same form grains, but using charcoal not so much baked, and therefore giving a slower powder. A 'slow-burning' cocoa powder soon came forward as an improvement. Long continued efforts were made to get a powder of more power per unit of volume, which would give in the reduced calibre small arm a higher velocity than gunpowder, with permissible pressures. The high explosives were tried, especially guncotton, in many forms, pressed and mixed with other substances, but with resulting high pressures and detonations, until, about 1884, dissolved guncotton gave after evaporation of the solvent a horny mass, which burned regularly without detonation. Similar treatment of combinations of guncotton and nitroglycerin gave similar results. It had been known that these explosives gave no smoke, their products being gaseous, but it was the desire for more power which brought them into use. The French quickly recognized the value of smokelessness as well as of power, and soon extended the use of the 'poudre B' of this class to all their cannon. The Germans used 'Wetteren,' and later 'ballistite.' The English later adopted cordite. Of these four powders the first two are of nitrocellulose (guncotton) and the others of this and nitroglycerin. In the United States it was not until well into the nineties that smokeless powders were adopted; for, although their advantages were recognized and many kinds experimented with, a later and more advanced stage of development was awaited. The navy adopted smokeless powder earlier than did the army. Nitrocellulose powders are most generally used in the United States. The forms of grain are many—long cords, spaghetti-like tubes, thin flakes, cubes, pierced prisms (generally for large guns), and others.



BROWN OR COCOA POWDER.
Hexagonal pierced prism grain.

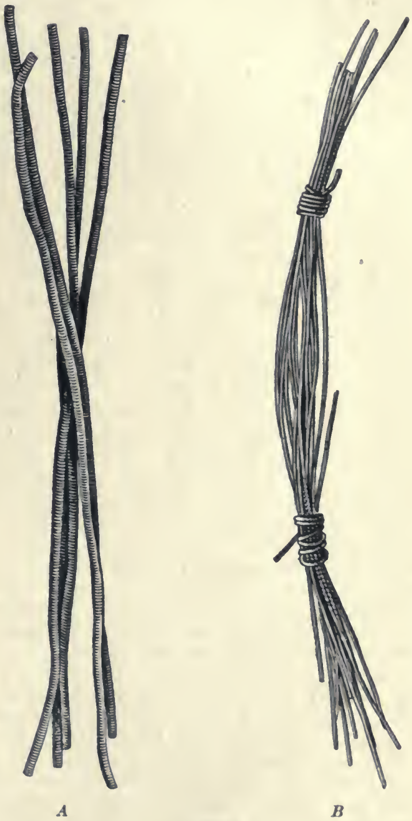


SMOKELESS POWDER.
Pierced cylinder grains for large guns.
A—Original grain. *B*—Partly burned grain.



SMOKELESS POWDER.
Hexagonal prism with one hole. Partly burned grain.
(*Outline shows original form.*)

Until very recently the *bursting charges* of shell consisted of a fine-grain black powder. Seeking a more destructive effect, experiments were made in Germany and in Italy between 1880 and 1890 with shell loaded with guncotton and other high explosives fired from common guns. These trials met with partial success, but the solution at that time seemed to lie in the pneumatic gun, which could throw projectiles carrying 500 pounds of high explosives instead of a few pounds only. For some years experiments in firing recent improved high explosives from common guns have been in progress. Lyddite (used by the English), melinite (used by the French since 1887), thorite, joveite, etc., have been tried by the United States, but none with complete satisfaction. Special shells have been devised with numerous separated compartments. The intent was to keep the charge from explosion from the shock produced by the setting down of a long column of powder upon discharge, without interfering with complete detonation upon impact. The Gathman system, of which much was at one time heard, comprised a large shell carrying wet and dry guncotton carefully packed and fired with a special fuse. The charge was expected to explode against the side of a vessel, with such force as to burst in her armored sides. Tests made in 1901-02, however, failed to demonstrate the success of the system, and it was officially decided to discontinue further experiments. Meanwhile, however, two explosives, maximite (Hiram Maxim's) and explosive D (proposed by Captain Dunn, Ordnance Department, United States Army), had been developed which could be fired safely in armor-piercing projectiles through an 11½-inch plate of best modern Krupp face-hardened armor and detonated on the inside with most destructive effect by a delay-action fuse.



CORDITE.
A—Original grains. *B*—Partly burned grains.
(*The illustrations are approximately two-thirds actual size of grains*).

MANUFACTURE OF EXPLOSIVES IN THE UNITED STATES. The manufacture of explosives is now one of the most important of the chemical industries in the United States. Its growth, as will be seen from the following table from the census of 1900, has been most rapid, and the 97 establishments manufacturing explosives were located in 21 different States. In Pennsylvania alone there were 36 such factories, while the 7 manufacturers of California produced over one-fourth of the amount made in the United States. In addition there were two factories belonging to the Government, which in 1900 produced 80,000 pounds of explosives, with a value of $60,506. That the production of explosives in the United States is not entirely for domestic consumption is shown by the fact that the exports of gunpowder in the year 1900 amounted to 1,612,822 pounds, valued at $197,438; while exports of all other explosives were valued at $1,694,166.

TOTAL PRODUCTION AND VALUE OF EXPLOSIVES, BY DECADES: 1840 to 1900

YEAR	Number of establishments	Capital	Average number of wage-earners	Products	
				Pounds	Value
1840......	137	$875,875	496	8,977,348	....
1850......	54	1,179,223	579	....	$1,590,332
1860......	58	2,305,700	747	....	3,223,090
1870......	36	4,099,900	973	....	4,237,539
1880......	54	6,585,185	1,340	....	5,802,029
1890......	69	13,539,478	2,353	98,645,912	10,993,131
1900......	97	19,465,846	4,502	215,980,719	*16,950,976

* This value is for the explosive substances only. When materials of all kinds produced in these establishments are included, the value is $17,125,918.

See also statistics under GUNPOWDER; DYNAMITE; NITROGLYCERIN.

LITERATURE. The great interest in military circles concerning explosives has led to the publication of a periodical in London entitled *Arms and Explosives.* The Bureau of Ordnance of the United States War Department issues, at intervals, *Notes on the Construction of Ordnance,* which contains the latest information on explosives, and Charles E. Munroe has published for many years a series of "Notes on the Literature of Explosives," in the *Proceedings of the United States Naval Institute.* The monographs of the leading experts, such as Abel of England, Berthelot of France, Munroe of the United States, and Von Lenck of Austria, should be consulted, in addition to which see the following, which are among the latest books on the subject: Cundill, *A Dictionary of Explosives* (revised ed. by J. H. Thompson, London, 1895); Guttmann, *Blasting: A Handbook for the Use of Engineers and Others Engaging in Mining, Tunneling, Quarrying, etc.* (Philadelphia, 1892); Bertholet, *Explosives and Their Power,* translated from the French by Napier Hooke and William MacNab (London, 1892); Eissler, *The Modern High Explosives* (New York, 1893, later ed., London, 1897); Munroe, *Index to the Literature of Explosives,* parts i. and ii. (Baltimore, 1893); Guttmann, *The Manufacture of Explosives: A Theoretical and Practical Treatise on the History, the Physical and Chemical Properties, and the Manufacture of Explosives,* with full bibliography of the subject from 1468 to 1895 (2 vols., London, 1895); Walke, *Lectures on Explosives* (New York, 1897); and De Kalb, *Manual of Explosives* (Toronto, 1900). See GUNPOWDER; GUNCOTTON; DYNAMITE; NITROGLYCERIN; ARTILLERY; BALLISTICS; ORDNANCE; and SMOKELESS POWDERS.

EXPO′NENT and **EX′PONEN′TIAL** (from Lat. *exponere,* to set forth, from *ex,* out + *ponere,* to put). An exponent, in the primitive sense, is a number-symbol which shows how many equal factors enter into a power; e.g. in 2^3, 3 is the exponent of 2; in a^5, 5 is the exponent of a. The exponent affects only the letter or number adjacent to which it stands, ab^3 meaning $abbb$. While the various forms and the theory of exponents have been matters of growth, the notation as now used was introduced into algebra by the mathematicians of the seventeenth century. Chuquet had (1484) used exponents, but not with the same significance as at present, and a step toward the theory of the subject, including the use of fractional exponents, had long before been made by Oresme (fourteenth century). Kepler (1619) speaks of Bürgi as having written for x, x^2, x^3, x^4 .... 1R, 1z, 1c, 1zz,... whereas he himself prefers $1, 1^{\mathrm{I}}, 1^{\mathrm{II}}, 1^{\mathrm{III}}$. .... Bürgi, however, wrote $\overset{\mathrm{II}}{16}$ for $16x^2$, and $\overset{\mathrm{IV}}{20}$ for $20x^4$. Harriot (q.v.) wrote x^2 for xx, x^3 for xxx. Wallis (1656) explained the expressions x^{-n} and $x^{\frac{1}{n}}$ as indicating the same as $\frac{1}{x^n}$ and $\sqrt[n]{x}$. The theory of exponents has gradually received extensions until it has become an important division of algebra. The following equations show the meanings of various exponents:

$$a^0 = 1,\ a^1 = a;\ a^{-2} = \frac{1}{a^2};\ a^{-n} = \frac{1}{a^n};$$

$$a^{\frac{1}{2}} = \sqrt{a};\ a^{\frac{1}{n}} = \sqrt[n]{a};\ a^{\frac{2}{3}} = \sqrt[3]{a^2}.$$

The fundamental laws of exponents in algebra are:

$$a^m . a^n \equiv a^{m+n};\ a^m : a^n \equiv a^{m-n};$$

$$(a^m)^n \equiv a^{mn};\ (ab)^n \equiv a^n b^n;$$

for all values of m and n. These operations are subject to the associative law (q.v.), $a^{m+n+p} = a^{(m+n)+p}$; to the commutative law, $a^{m+n+p} = a^{p+n+m}$, and to the distributive law, $a^{(m+n)p} = a^{mp+np}$. In quaternions (q.v.) and certain other branches of modern mathematics the conventions as to exponents differ.

Functions in which the variable or variables are involved as exponents are called exponential functions; e.g. $a^x = c$, $x^x = b$, $2^x = 8$. In the last example x evidently equals 3. When such equations cannot be solved by factoring, it is best to apply logarithms (q.v.). Thus in $2^x = 80$, $x \cdot \log 2 = \log 80$, and $x = \frac{\log 80}{\log 2} = 6.322$. The series $e^x = 1 + x + \frac{x^2}{1 \cdot 2} + \frac{x^3}{1 \cdot 2 \cdot 3} + \frac{x^4}{1 \cdot 2 \cdot 3 \cdot 4} + \cdots$ is called the exponential series. If x be taken as 1, the series gives $e = 2.718281828 \ldots$, the base of the hyperbolic logarithms (q.v.).

EXPOSITION. See EXHIBITIONS, INDUSTRIAL.

EXPOSITION OF THE SACRAMENT. In the Roman Catholic service, the public exhibition of the Holy Sacrament, instituted with certain ceremonies for the veneration of the faithful. There is evidence to warrant the belief that as early as the fourteenth century the sacrament was thus exposed at least on Corpus Christi; but not until the sixteenth century did it become customary to expose the Host at other times, as on occasions of public distress, when it is said to have been introduced by a Capuchin of Milan, Father Joseph, who died in 1556. The practice is still in use of placing the Host within the monstrance above the altar and appointing persons to relieve each other night and day in watching and praying for a period of forty hours. On the second day a mass 'for peace' is sung, and it is again placed in the tabernacle after a high mass (that of deposition) has been sung. The exposition is not allowed without leave from the bishop or without an Apostolic indult. Usually no mass is celebrated at the altar during the exposition; the bells are not rung at masses said at other altars. Consult Maier, *Die liturgische Behandlung des Allerheiligsten ausser dem Opfer der heiligen Messe* (Ratisbon, 1860).

EX POST FACTO (Lat., more accurately *ex postfacto*, from what is done afterwards). A legal term, designating something as done after or arising from or affecting another thing that was committed before. In this broad sense, it is applied to the acceptance of an estate by the grantee in a deed, conveying it to him, which estate he had the right to reject or accept. It is also applied to every act of a legislative body, or of a court, having a retroactive effect. The term is most frequently used, however, in a narrower and more technical sense. This is due to certain provisions of our Federal and State constitutions, prohibiting the enactment of *ex post facto* laws. The term in this connection does not embrace retrospective laws in general, but is confined to laws of a criminal or penal nature. Hence, a statute setting aside a decree of the Court of Probate rejecting a will and directing a new hearing before the court is not within this constitutional prohibition, however repugnant it may be to the principles of sound legislation. In order to come within the prohibition the law must render an act punishable in a manner in which it was not punishable when it was committed. It is not necessary, however, that the punishment be of a strictly criminal character. A law which excluded a minister of the Gospel from the exercise of his clerical functions, and a lawyer from practice in the courts, unless he would take an oath that he had not engaged in or encouraged armed hostilities against the Government of the United States, was declared by the United States Supreme Court to be *ex post facto* because it punished in a manner not before punished by law offenses committed before its passage, and because it instituted a new rule of evidence in aid of conviction. On the other hand, a statute is not *ex post facto* which mitigates instead of increasing punishment, or which changes the rules of evidence or procedure in matters of detail without impairing any substantial right which the law gave the accused at the time when his alleged criminal act was done. In conclusion, it should be remembered that the constitutional provisions in question have always received a liberal construction, with the view of giving full effect to this avowed purpose of protecting the individual right of life and liberty against hostile retrospective legislation. Consult: Cooley, *The General Principles of Constitutional Law in the United States* (Boston, 3d ed. 1900); *Kringo* vs. *State of Missouri*, 107 United States, 221.

EXPRESS (Lat. *expressus*, distinct, p.p. of *exprimere*, to express, from *ex*, out + *premere*, to press). A business which has grown within the past quarter of a century to be of enormous importance. It was in the spring of 1839 that William F. Harnden advertised to take charge of money and small parcels to transmit between Boston and New York, and from his single carpet-bag has risen a system of intercommunication between places and persons that, for numbers of stations and length of route, is surpassed only by the post-office department. The most valuable articles are sooner intrusted to a responsible express than to Government rails; for, in addition to ever-increasing care, there is a system of package insurance which secures the owner in almost any case of loss. A large proportion of the business is the collection of small sums for merchants. To these familiar features the express companies have generally added in the last decade a money-order business, which has led some of them into international banking and the issue of checks for the use of travelers—a modified form of the letter of credit (q.v.). Corresponding institutions do not exist in Europe, where the parcels post and the postal service as a rule fulfills acceptably the functions which in the United States are in the hands of the express companies.

EXPRESSION (Lat. *expressio*, from *exprimere*, to express). In music, the method of clearly presenting the emotional and intellectual characteristics of a work. There are a few broad rules which are generally accepted as being at the basis of expression. A *crescendo* movement is usually accompanied by an intensification, a *diminuendo* by a slight drawing back; a musical phrase is played with increasing fervor to its climax, and from that point is diminished to its end; any striking melody or rhythm in a passage should be emphasized; a modulation to a new key is accompanied by a *crescendo*. It is interesting to note that passages of increasing intensity generally have rising melodies, while those which show a decrease have falling. There are a number of works on the theory and practice of expression, among them: Lussy, *Traité de l'expression musicale* (Paris, 1873, translated into English, London, 1885; into German, Leipzig, 1886); Klauwell, *Der Vortag in der Musik* (Berlin, 1883); Riemann, *Musikalische Dynamik und Agogik* (Hamburg, 1884); Christiani, *Das Verständnis im Klavierspiel* (Leipzig, 1886); Haweis, *Music and Morals* (London, 1871).

EXPRESSION, EXPRESSIVE MOVEMENTS. That bodily movements may serve as indexes of mental states is a matter of daily observation. The smiling face, the bright eye, the animated gestures characteristic of joy and pleasantness, contrast sharply with the attitude of dejection which sorrow and grief entail. Experimental methods have shown that even the simplest modes of affective experience, the pleasure of an agreeable odor, the unpleasantness of a discord, are accompanied by distinct and specific alterations of certain physiological functions. When we are pleased the pulse is strong, we breathe more deeply, the blood flows more freely into the peripheral blood-vessels, and we are muscularly stronger. But it is naturally in the more complex and far-reaching nervous disturbance of the emotion (q.v.) that bodily expression becomes so well marked as to be accessible to external observation.

One of the peculiar features of emotional expression is the seemingly useless and even positively disadvantageous nature of certain of the bodily disturbances. Why should we curl our lip in scorn? Why should we clap our hands for joy, or blush for shame, or tremble for fear? It is in answer to such questions that various authorities have deduced what are called 'the principles of expression,' with the aim at once of classifying and of explaining the genesis of the expressive movements. The best-known and most important contributions to this subject are those of Darwin, Wundt, and James.

In 1873 Darwin brought forward three principles, by which he hoped to account for most, if not all, of the expressive gestures involuntarily used by man and the lower animals under the influence of the emotions. Darwin's principles are as follows: (1) *The principle of serviceable associated habits.* Many complicated movements which under certain circumstances were of direct or indirect use are retained when their use is no longer apparent, in consequence of the general laws of association, habit, and inheritance. Thus the cat executes peculiar 'pawing' movements with the fore feet when it is pleased. These movements are the relic of the purposeful use of the same movements to start or increase the flow of milk from the mammary glands of the mother. The movements became thereby associated with a pleasurable and satisfied consciousness, and tend to recur whenever such a consciousness recurs. Wundt considers that this principle is but a special case of Darwin's third, the direct action of the nervous system; for the overflow of nervous energy takes those paths which are habitual and most frequently used. (2) *The principle of antithesis.* As Darwin explains it, "every movement which we have voluntarily performed throughout our lives has required the action of certain muscles; and when we have performed a directly opposite movement, an opposite set of muscles has been habitually brought into play. . . . So when actions of one kind have become firmly associated with any sensation or emotion, it appears natural that actions of a directly opposite kind, though of no use, should be unconsciously performed through habit and association under the influence of a directly opposite sensation or emotion." Thus impotence is expressed by raised eyebrows, shrugged shoulders, and open palms; since these are the antithesis of the frowning brow, the thrown-back shoulders, and the clenched fists, symbolic of rage and power. James says in comment: "No doubt a certain number of movements can be formulated under this law; but whether it expresses a *causal* principle is more doubtful. It has been by most critics considered the least successful of Darwin's speculations on this subject." (3) *The principle of the direct action of the nervous system;* or of actions due to the constitution of the nervous system, independent from the first of the will, and independent to a certain extent of habit. The sudden release of large quantities of nervous energy demands unusual outlet from the central nervous system. This overflow takes place according to the preformed connections of the nervous elements. Its results are visible in the general disturbance of organic function due to the exciting or inhibitory effects of these irradiations of energy from the central nervous system. On this principle are explained such phenomena as the muscular tremors of fear or of great joy; the increased glandular activity of the liver, kidneys, and mammæ; the alterations in cardiac and vasomotor functions; and such movements as the clapping of the hands for joy. It is admitted by James, and is practically identical with the first principle of Wundt.

Wundt's principles are likewise three in number. (1) *The principle of direct change of innervation.* This is but a different wording of what we have just discussed as the third principle of Darwin. It involves the principle of the hereditary transmission of certain nervous connections; thus the reflex of weeping, which probably falls in origin under the third principle, has by inheritance come to take its place under the first. The transmission of a characteristic family physiognomy or general expressive attitude is very common; and we invariably argue from the physical similarity to a similarity of mood, even though there be no possibility of imitation of the parents by the children. These direct changes in innervation are almost always accompanied by a noticeable reactionary effect upon the ideational course of the emotion. The frightened man stutters, not merely because his tongue mechanically refuses service, but also because his thoughts are really brought to a standstill. (2) *The principle of the association of analogous sensations* is based upon the fact that sensations of similar feeling-tone easily associate and reinforce one another. This process forms the basis of the most characteristic of all emotive expressions, the 'mimetic movements.' These are physiologically conditioned by reflex movements in and about the facial sense organs; thus the expression which stands for 'bitter' is an arrangement of the parts of the buccal cavity most sensitive to bitter in such a way as to prevent their excessive stimulation by the unpleasant taste. The 'sweet' expression, on the contrary, is that calculated to favor the continued stimulation of the tip of the tongue, the part most sensitive to sweet substances. By virtue of the second principle these reactions have come to appear in response not only to an actually bitter taste, but also to an emotional condition which possesses the same general feeling-tone. So the expression has become symbolic. A wry face may denote a mental as well as a physical pain. (3) *The principle of the connection of movement with sense ideas* explains all the facial expressions and gestures which are not included under the two previous principles. Here belong movements of the arms and hands, the clenching of the fists in anger, and also certain facial expressions, such as the curling of the lip in scorn, and the staring eyes of surprise. The principle seems closely allied to Darwin's first. It is not to be thought that any complex expression of emotion must be explained by a single principle. Such phenomena as laughing and weeping demand the use of all three principles for their elucidation.

James proposes the five following principles: (1) *The weakened repetition of movements which formerly were of utility to the subject.* This is equivalent to Darwin's first proposition. (2) *The principle of reacting similarly to analogous-feeling stimuli.* This is identical with Wundt's second principle. (3) *The principle of* *weakened repetition of movements which under other conditions were physiologically necessary effects.* The respiratory disturbances of anger and fear, e.g. may be considered as "organic reminiscences . . . of the blowings of the man making a series of combative efforts, of the pantings of one in precipitate flight." (4) *The principle of the mechanically determined idiopathic effects of the stimulus,* i.e. the physiological outpourings of excess of nervous energy through the easiest drainage channels (cf. Wundt's first and Darwin's third law). (5) *The principle of the mechanical perpetuation of emotional reactions which may be called accidental as far as their origin goes.* For some of our emotional reactions no plausible reason can be conceived. "In fact, in an organism as complex as the nervous system there must be many such reactions, incidental to others evolved for utility's sake, which would never themselves have been evolved independently, for any utility they might possess." In conclusion it may be said that no one of these explanatory series of principles is logically complete. There is need of further observation, and perhaps of a new construction of principles upon the basis of the psychology of action (q.v.). Consult: Darwin, *The Expression of the Emotions in Man and Animals* (London, 1890); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1893); James, *Principles of Psychology* (New York, 1890); Titchener, *Primer of Psychology* (New York, 1899). See GESTURE.

EXPULSION (Lat. *expulsio,* from *expellere,* to drive out, from *ex,* out + *pellere,* to drive). The act of removing one from the possession of real property, or from an office, or from membership in a body or association, or of depriving him of a right, privilege, or license. Expulsion of the first sort is called eviction (q.v.). The manner in which a public officer may be expelled or removed is generally regulated in this country by constitutional or legislative provision. For example, the Federal Constitution secures to each House of Congress the power to expel a member with the concurrence of two-thirds. In the exercise of this authority, it may proceed summarily, and need not observe the formalities of judicial procedure. Nor does any appeal lie from its decision. The same Constitution secures to Federal judges both of the supreme and inferior courts tenure of office during good behavior. Recently many statutes have been passed by Congress, and by State Legislatures, limiting or qualifying the power of removing persons from office in certain lines of the civil service (q.v.).

Members of a corporation may be expelled in certain cases, as where they have been convicted of an infamous crime or have been guilty of some corrupt or dishonorable conduct in connection with the affairs of the corporation. A partner cannot be lawfully expelled from his firm, unless the partnership contract expressly authorizes expulsion. In such a case, as well as in all other cases of unincorporated associations, the member proceeded against is entitled to notice of charges and an opportunity to defend himself, as well as to a fair and impartial decision. See CLUB.

Persons who are not members of a public body or of a private corporation or association may be expelled from its meetings at any time. Even though their attendance has been induced by an authorized invitation, the license or privilege may be withdrawn at any moment; and if they refuse to leave they may be forcibly removed. The same rule holds good in the case of other meetings. Those who convene them have the right to expel objectionable persons, provided they use no more force than is necessary for that purpose. Consult: Thompson, *Commentaries on the Law of Private Corporations* (Saint Louis, 1895); Pollock, *Treatise on the Law of Torts* (6th ed., London and New York, 1901).

EXTENDED ORDER. See INFANTRY; TACTICS, MILITARY.

EXTENSION (in logic). See DENOTATION.

EXTENSION, EXTENT (Lat. *extensio,* from *extendere,* to stretch out, from *ex,* out + *tendere,* to stretch). The simplest spatial determination of mental processes, as duration (q.v.), is their simplest temporal determination. Not all psychologists are agreed upon the existence of extent as an intrinsic attribute of sensation; but for the present purpose we may provisionally assume that extent, in the sense of 'spread-outness,' is a characteristic feature, at least, of visual and cutaneous and articular sensations. The validity of this assumption will be discussed later. Of the psychological problems concerned with spatial relations, the majority, such as the perception of form, of distance, position, order, arrangement, the geometrical-optical illusions, etc., take us beyond the treatment of extent as an attribute of sensation. Within the sphere of sensation there are theoretically three problems to be solved: (1) that of the smallest noticeable extent; (2) that of the largest noticeable extent; and (3) that of the just noticeable difference of extents, or the sensible discrimination (q.v.) for extent. These problems must be attacked in the sphere both of visual and of haptical sensations, though the latter are, for practical reasons, limited to a single quality, pressure.

The second question is at once the least important theoretically and the least difficult of solution. Maximal extent of pressure may be obtained, e.g. by immersion of the entire body in water. The 'maximum visible' is obviously measured by the total area of the 'field of vision.' This embraces for a single eye a region delimited by the following angles (based upon the straight line joining the centre of the pupil with the centre of the 'yellow spot'): outward, 70°-85°; inward, 60°-50°; upward, 45°-55°; downward, 65°. Hence the maximal field is, for a single eye, an oval measured by a visual angle of 130°-135° horizontally, and 110°-120° vertically.

The first problem, that of the smallest noticeable extent, brings us to the well-worn question of the 'minimum visible.' Two factors must be constantly regarded: (1) In the neighborhood of the stimulus-limen, extent and intensity play into each other's hands. An imperceptibly small area may become perceptible with increased illumination; an imperceptible degree of illumination may become perceptible with an increase in its area. (2) Owing to the error of dispersion (diffusion of stimulation upon the retina), the extent of the object used as a stimulus may not correctly indicate the extent of the stimulated portion of the eye. In the method of Helmholtz the least noticeable visual extent is determined by approximating two luminous points or lines placed at a constant distance from the eye, and recording the limit (expressed by the visual angle or the distance between the two retinal images) at which they are just distinguishable. The *keenness of vision*, thus measured, varies with the part of the retina stimulated, being one minute of arc (or 0.004 mm. between images) at the fovea, and decreasing to 1/100 of this value at 30°-40° from the fovea. More recent determinations by Stratton, excluding the error of dispersion, indicate that a lateral displacement in the relative position of two vertical, end-on-end lines is detected when the visual angle is but seven seconds of arc. Hence, it is argued, the 'minimum visible' is distinctly smaller (0.0005 mm.) than the diameter of a single cone (estimated at from 0.0015 to 0.0044 mm.). But it is doubtful whether these figures, expressing as they do the limen for separation of points, give us any indication of the least visible extent; any more than the least distance for the cutaneous discrimination of two points can be regarded as the least perceptible cutaneous extent. The judgment of two lines or two points does not necessarily carry with it any reference to space. We shall do better, perhaps, to consider the retinal cone as affording the unit of visual extent; although, as Schoute's experiments indicate (see below), a limited extent may be less, under certain conditions, than the diameter of a single cone. The limen is further dependent upon the quality of the stimulus. Lane has shown that the space-limen for colors must be expressed in terms of three values: (1) the achromatic limen, at which brightness appears; (2) the chromatic limen, at which color of any sort is seen; and (3) the 'characteristic' limen, at which the actual color-tone of the stimulus is perceptible. The last limen is highest for orange, yellow-green, and violet, lowest for yellow, blue-green, and red-purple; i.e. a relatively large extent of orange, etc., is necessary to allow the perception of its true color. For red all three limina coincide.

We may regard the pressure spot as the unit of cutaneous extent, as the retinal cone is that of visual extent. The limen of pressure separation, falsely assumed to be identical with the liminal extent, was first investigated by E. H. Weber. Weber's results show clearly the dependence of the limen of separation upon the place stimulated. The following values, taken from his classical table, illustrate this point: Tip of tongue, 1 mm.; tip of finger, 2 mm.; cheek, 11 mm.; forehead, 23 mm.; middle of back, 68 mm. By the stimulation of individual pressure spots Goldscheider found much lower values: Chin, .3 mm.; cheek, .4 mm.; forehead, .7 mm.; back, 5.0 mm. Subsequent work upon æsthesiometry, or 'Weber's sensory circles,' as these experiments are called, has emphasized the law of Vierordt that the space-limen at any point in the length of a limb is inversely proportional to the distance of the stimulated part from the axis of rotation, and have called attention to the rapid increase of the limen of separation with fatigue—an increase so characteristic as to be urged by Griesbach as a practical test for degree of general fatigue.

The third problem, discriminability, is termed in the sphere of vision 'eye measurement.' The results of the many investigations made are often different, since they depend upon many factors difficult of isolation even under experimental conditions. These factors are eye movement, the quality of the compared extents (see Illusions, Optical), their absolute length, their distance from the eye, their direction (vertical, horizontal, etc.), the use of monocular or binocular vision, etc. Running the eyes along the lines, i.e. the introduction of the strain sensations set up in the eye muscles, appears to aid discrimination of linear extents. When we estimate extent in this way, i.e. partly in terms of intensity, the relative difference limen is constantly at 1/50; two lines seem different if one is one-fiftieth longer or shorter than the other. Lately Schoute has demonstrated that, with the resting eye, one can discriminate at least four different extents, all of which fall within the limits of a single retinal cone, although the actual basis of this discrimination is the quantity of light which falls upon the cone. The discrimination of tactual, like that of visual, extents, is complicated by extraneous factors; arm-movement measurements involve the factors of the duration and intensity of strain sensations, while in cutaneous experiments proper it is difficult to exclude judgments based upon visual terms. Two circular surfaces applied to the tip of the tongue may be recognized as different when their diameters are no more than 0.5 mm. and 1 mm.; but on the back they must be 2 mm. and 25 mm. respectively. Cold surfaces appear larger than warm surfaces of equal size.

Our provisional assumption posited extent as an ultimate property of certain sensation systems, as irreducible and unanalyzable as quality or intensity. This view regards the perception of depth and all other spatial relations as derivative products of associations formed by experience. Thus the quasi-spatial nature of certain sense-qualities, e.g. the seeming differences in the 'bigness' of sounds, does not demand the assumption of any elementary spatial attribute in these sensations. It remains to be pointed out that this view of extent has not gained universal acceptance. At the one extreme certain psychologists, notably Wundt, seek to derive all spatial determinations of mental processes from other non-spatial contents of consciousness. (See Fusion.) They do not, therefore, postulate a spatial attribute for any sensation system. At the other extreme certain psychologists, of whom James may be considered typical, ascribe an elementary spatial attribute not only to visual and cutaneous, but to all sensations. James prefers the term 'voluminousness.' "This element, discernible in every sensation, though more developed in some than in others, is the original sensation of space. . . . This 'vastness' is as great in one direction as another. Its dimensions are so vague that in it there is no question as yet of surface as opposed to depth; 'volume' being the best short name for the sensation in question." From the psychological standpoint the merit of these three positions can be adjudicated only upon the verdict of trained introspection as aided by the experimental method. The principle of parsimony must incline us to the simplest consistent theory. From this point of view the merit appears to lie with those who maintain the middle position, though from the genetic side the Wundtian explanation is most satisfactory. In other words, we may consider that the adult human consciousness is unable by introspection to get behind extent or 'spread-out-ness' as an ultimate datum of experience, although we may construct a theory of its genesis from other, simpler non-spatial processes.

Consult: Külpe, *Outlines of Psychology*, translated by Titchener (London, 1895); James, *Principles of Psychology* (London, 1890); Titchener, *Outline of Psychology* (New York, 1899); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1893); id., *Outlines of Psychology* (Leipzig, 1898).

EXTERRITORIALITY. The fiction or rule of law by which certain classes of aliens in a country are more or less exempted from its jurisdiction, and are governed by the laws of their own country. The right to this exemption is not absolute, but arises from, and is made possible by, the comity of nations; and the reasons for its existence are to be found partly in the survival of ancient laws, partly in reasons of State, and partly in the purpose of protecting the citizens of civilized nations against the unsuitable laws of more barbarous countries.

Entrance into a country, on which the privileges of exterritoriality are based, may be suspended or entirely refused (see ALIEN); as, for example, the entrance of a foreign sovereign or prince may be prohibited for reasons of State, or of foreign armed ships or armies.

The privileges arising from exterritoriality are extended particularly to sovereigns, diplomatic agents, especially ambassadors and their suites, family, and servants, and to public armed vessels and armies in permitted transit. The person of a sovereign traveling in a foreign country is inviolate, and he is exempt from the law of the land; but he has no greater powers than he would have at home, and has no authority over any except his own subjects who form part of his suite, retinue, or servants. This privilege does not at any time extend, either in the case of sovereigns or any other, so as to exempt from the local laws any property, real or personal, belonging to such person except the effects brought with him. Public armed vessels are to be distinguished from vessels of private citizens. Although the latter, so long as they are upon high seas, remain fully subject to the jurisdiction of their own country, whenever they enter within the waters of a foreign country they become, with all on board, subject to the laws of the country within whose waters they are as fully as if ashore. A public armed vessel, however, and vessels chartered to convey a sovereign or his representatives, continue subject, with their crews, to the law of their own country. When ashore the crew become subject to the local administrative law, and if guilty of aggression or hostility can be arrested forcibly if necessary, and punished according to the law affecting the aggression committed. Such transgressions expose the guilty persons not only to arrest and trial, but to complaint to their own sovereigns. The public vessel, however, may not exceed the privileges extended to it, on account of its character, and exercise other rights which it would have on the high seas, such as committing an act of war or the capture of foreign vessels while within the waters of a foreign State. The permission to an army to go through a foreign country carries with it the right to maintain its discipline, and do all other things connected with the passage of the troops which may be necessary to maintain the integrity of the army during its passage. This may extend to the purchase of provisions, but will not excuse crimes or breaches of the public law of the land. The permission is rarely extended, and when it is, it is usually by a treaty. The privileges extended to ambassadors and other diplomatic agents arise partly from the consideration that they are essential to the proper conduct of the business intrusted to him and partly from considerations of respect to the foreign sovereignty represented. They begin when he enters the country and continue till his departure, or until a reasonable opportunity for it has elapsed. For a discussion of them, see DIPLOMATIC AGENTS.

Analogous to these privileges arising out of the comity of nations are those which are secured by treaty for foreigners from Christian lands in certain Oriental countries, where the prevailing laws and usages are unlike those of Christendom, or are so barbarous that there is reason to fear that justice will not be done, or that it will be administered in such a manner as not to protect life, limb, and property according to the standards of civilization existing in Christendom. By treaties between the United States and China, Korea, Borneo, Madagascar, Persia, Turkey, Samoa, Siam, Zanzibar, and Tonga, the citizens of the United States are more or less fully exempted from local jurisdiction, and are allowed to remain under the jurisdiction of the United States. Formerly the United States had such a treaty with Japan, but upon the opening of that country to modern civilization the treaty was terminated. (See CONSUL.) Exemption from ordinary harbor or port charges and from local jurisdiction is also ordinarily accorded to vessels driven into foreign waters against the will of their masters, and they are allowed to depart unhindered. Consult: Woolsey, *Introduction to the Study of International Law* (7th ed., New York, 1902); Phillimore, *Commentaries on International Law* (London, 1889); and the authorities referred to under CONSUL; DIPLOMATIC AGENTS; INTERNATIONAL LAW, etc.

EXTERIOR BALLISTICS. See BALLISTICS.

EXTINCT ANIMALS. Extinct animals, as the term is used in the present article, means those whose species have been exterminated since the advent of man upon the earth, and in most cases, as a matter of fact, by his agency, directly or indirectly. It is not to be presumed that a complete list of species so exterminated could be given, since many, no doubt, completely disappeared before any sort of record began. Others, as we know or suspect, survived into the era of prehistoric man, but not later. Many species, however, have disappeared, not only since written records began, but within the past century or even within the memory of men now living; and it is these which will demand most attention.

EXTERMINATING INFLUENCES. The causes of the disappearance noted arise from man's varied utilization of nature for his benefit or pleasure. Directly, he destroys animals (1) for the sake of their flesh as food, or of their skins as clothing, bedding, or shelter, and for various utilizations of other parts and products; (2) because they may be dangerous to his life, or troublesome to his enterprises or comfort; (3) in sport; (4) by domestication. Indirectly, animals suffer, sometimes to the extinction of their species, by man's clearing of the forests, draining of marshes, burning over areas by prairie and forest fires, damming or divergence of rivers, fencing in and cultivation of the ground, thus destroying pasturage and other food, limiting movement, and in many ways interfering with animal methods and means of obtaining a livelihood. Another potent influence is man's turning loose upon wild life new enemies in the shape of his domestic dogs, cats, rats, goats, or hogs, or of introduced exotic animals, all of which, intentionally or otherwise, are injurious to some or many wild creatures, and in some instances have been the principal agent in the extermination of lost forms. Many minor circumstances have contributed to the depletion or disappearance of animals in all the more civilized parts of the earth; and it must be remembered that the extinction of any species has a distinct effect upon some or many others. Thus the removal of the herbivorous quadrupeds from a region would result in death by starvation of all the larger carnivores of that region.

EXTERMINATION OF ANIMALS BY PREHISTORIC MEN. Just how far we are to attribute to the direct agency of primitive man the extinction of forms that evidently survived until after his advent upon the earth must be a matter largely of opinion. There seems good reason to suppose that the last of various species of moa-like birds were destroyed by the primitive inhabitants of New Zealand and Madagascar; but there is a fair possibility that the cold of the Glacial Period is wholly responsible for the end of a group that no doubt was waning. The same remarks apply to the mammoth and mastodon. That man was contemporary with the last of the mammoths in southern Europe seems indubitable; that the American mastodon was ever seen alive by human eyes is, on the other hand, very doubtful. At any rate, the termination of their career over the vast areas of the northern half of our hemisphere cannot be attributed to human hands. Paleolithic man probably hunted not only the mammoth, but several other animals whose early extinction may have been hastened in southern Europe, such as the huge sabre-toothed tigers (Machærodus), the ancient grizzly and brown bear, the larger varieties of the lion and spotted and striped hyenas, the woolly rhinoceros (*Rhinoceros tichorinus*) and related species, and various smaller animals long extinct. Some of these were northern, like the musk-ox, reindeer, Arctic fox, etc.; others southern, like the African elephant and hippopotamus. In the changes of climate which accompanied and followed the Glacial Period these and other species disappeared from southern Europe, to survive, if at all, only in the north or in Africa, as their adaptations required. Certain species we know or may feel sure survived until destroyed by mankind. Such was the case with the great-horned Irish deer (see DEER; ELK), which assuredly survived until the close of the 'Bronze Age.' The two most interesting instances of prehistoric extermination, however, are those of the horse and the camel. The wild stock of neither of these has been certainly known within historic times. How long it may have survived in Asia or northern Africa we have no present means of knowing; still less of answering the question whether any indigenous horse was contemporary with early man in South America. Much evidence exists, however, of the presence of native horses in Europe well on into the Neolithic period of human settlement there. They were hunted and killed mainly for food, no doubt, but seem to some extent to have been domesticated. Just how long they lasted is uncertain, but it seems indubitable that man is responsible for their ultimate extinction. Whether, at some earlier period, a separate species of dog, the founder of the races of domestic dogs, ever existed, or if so was exterminated after partial domestication by man, is purely conjectural. (See DOG.) The saiga was killed off in southwestern Europe prehistorically, but has survived eastward.

EXTERMINATION IN THE OLD WORLD WITHIN HISTORIC TIMES. Since written records began, several species have vanished from the fauna of Europe, but remain elsewhere, or are preserved in carefully guarded remnants. The lion, tiger, leopard, and various wildcats once inhabited the valley of the Danube, and the lion was common there in Roman times. When the Romans first penetrated central and western Europe they found numerous not only the 'bonasus,' which we now mistakenly call the aurochs, but a race of great wild cattle. Mere remnants of these (see BISON; CATTLE) remain in a more or less impure condition on private preserves. The native roe and fallow deer (qq.v.) would long ago have perished had they not been protected and bred in parks and hunting forests. The chamois of the Alps survives only under legal protection, which has not sufficed to keep the ibex, now utterly extinct. The same might be said of certain lesser animals. Brown bears existed in Scotland up to the time of Edward the Confessor, but not later, and the last reindeer disappeared from Caithness about the same time. The beaver probably remained in Scotland and Wales until the thirteenth century. Wild boars were hunted until the end of the seventeenth century, and the wolf eluded his doom much longer, the last one being killed in England during the reign of Henry VIII., in Scotland in 1740, and in Ireland in 1775.

Asia furnishes few or no examples of animal extinction of importance since written records began, with the exception of the rhytina and a cormorant, both of which once dwelt on islands off the coast of Kamchatka. The rhytina was a sea-cow, closely related to the manatee (q.v.), but much larger, which was confined to the Commander Islands in Bering Sea, where it was discovered by the expedition of Bering, which was wrecked there in 1741. During the next twenty years these islands were constantly visited by seal and fur hunters, who slaughtered the animals to obtain their beef-like flesh. It has been estimated by Stejneger (*American Naturalist*, vol. xxii., Philadelphia, 1887), who made local investigations, that not more than 3000 rhytinas herded there altogether, and the last one was killed about 1768. In the same island group, and nowhere else, there dwelt a very large but small-winged cormorant (q.v.) called Pallas's, after the Russian naturalist, its first describer. It was stupid and slow in its movements, furnished excellent flesh, and although a few survived the occasional visits of hungry sea-hunters until 1839, at least, the end then came.

LIABILITY OF INSULAR FAUNAS TO DESTRUCTION. The examples just recounted illustrate many cases in which inhabitants of small islands have succumbed to changes in their limited circumstances. Thus the New Zealand group has lost several birds which were either confined to isolated and limited places or were helpless to escape from European colonists. A certain quail (Coturnix) and the owl parrot (Nestor) are gone; and of two species of kaka parrots (*Nestor productus* and *Norfolkensis*) none remains upon either Philip or Norfolk islands, where they abounded respectively previous to 1850. Several other Australasian species which spend their lives upon the ground are weak of flight, and, unaccustomed to such enemies, are rapidly disappearing under persecution by rats, and by imported ferrets, weasels, etc., introduced by the English settlers in an unwise attempt to subdue the plague of rabbits, which they had previously 'acclimatized.' One of the forms most threatened are the curious flightless weka (q.v.) rails, of which closely allied species once existed on Norfolk Island, on Lord Howe Island, and on one of the Chatham Islands. Dixon quotes Dr. Forbes in the statement that seventeen species of birds that formerly lived on Chatham Island have become extinct. The civilization of the Sandwich Islands has led to the destruction of several birds, one of which, the mamo (q.v.), was sought for the sake of its rich yellow feathers, used as an ornament of the cloaks of the chiefs, until none remained; another, related to the wattle-crows, succumbed to the clearing of certain brushy woods by cattle and goats. Tahiti seems to have lost utterly a certain rail (*Prosobonia leucoptera*) and Latham's white-winged sandpiper (*Hypotœnidia Pacifica*); and another shore-bird (Æchmorynchus) has died out in the Christmas Island group.

The most conspicuous examples of island birds extinguished since white men discovered their isolated homes are afforded, however, by Mauritius and the neighboring islands of the Indian Ocean. Mauritius, when rediscovered by the Dutch at the end of the sixteenth century, was inhabited by that singular and inept bird the dodo (q.v.), relations of which (see SOLITAIRE) have perished likewise in the islands of Réunion and Rodriguez. In Mauritius, besides the dodo, at least two species of parrot, a dove, a large coot, and a second ralline bird, abnormally flightless and long-billed, called Aphanapteryx, have become extinct. Réunion, also, once had other birds now lost, and so had Rodriguez. In Réunion, a somewhat abnormal starling, Fregilupus, existed until about 1850, while from Rodriguez the greater part of its original avifauna has vanished. There were a small but peculiar owl (*Athene murivora*), a big parrot (*Necropsittacus Rodericanus*), a dove (*Erythrœna*, sp. ign.), a large brevipennate heron (*Ardea megacephala*), and a singular rail, besides other birds of which we know from the old voyagers.

The destruction of bird life in these islands was due not only to direct chase by man, but indirectly to the introduction of domestic or other animals. The hogs let loose in the Mascarene Islands finished the dodos and their relatives, and rats have done great mischief in Oceanica. Fires, too, have burned the coverts, destroyed nests and eggs, and killed much or all of the food of many species by consuming reptiles, insects, mollusks, worms, etc., great numbers of species of which are also to be counted among the animals recently extinct. This agency was especially potent in the Antilles.

The turtle tribe presents a parallel case of extinction in the island-inhabiting species of gigantic tortoise (q.v.)—isolated survivors of forms widespread during the later Tertiary age. During the historic period various species of these gigantic tortoises have been numerous on the Mascarene Islands, on Aldabara, a small island northwest of Madagascar, and on the Galapagos Islands, west of South America. At the end of the seventeenth century they existed by thousands in Mauritius (three species), Rodriguez (one species), and Réunion (one species). In Mauritius they were still abundant until about 1750, when they became so scarce that importations from Rodriguez were made by the shipload, as food for the garrison; and the continuance of these supplies (also sent to the Seychelles), together with the constant destruction of the eggs, exhausted the stock of tortoises about the end of the eighteenth century. Those of Réunion had vanished long before; and a single aged captive at Saint Louis, Mauritius, still alive in 1895, at an age probably approaching 200 years, is the sole survivor of the great herds of Rodriguez. Aldabara had originally four species, one of which, the elephant tortoise, only survives, and is very scarce. The Galapagos possessed several species, all good for food, and now destroyed with the exception of a few on Albemarle Island, and about 100 specimens living in various zoölogical gardens. See TORTOISE.

Africa has been the scene of extraordinarily rapid changes in faunal characteristics during the last century, and its later decades have witnessed the extermination as wild game, if not absolutely, of many of the largest and finest quadrupeds in its list. The herds of elephants buffaloes, antelopes, and other grazers which thronged upon the plains and in the forests of South and Central Africa when Europeans began to colonize there, were past counting.

This wealth of game was ruthlessly destroyed by Arab and Portuguese traders and Dutch farmers, and then by English and German sportsmen, settlers, and hide-hunters—the last the worst agents of destruction, as has been the case in America. The result has been the depletion of game throughout all the more open regions, until now many species, exceedingly numerous previous to 1850, have become rare, and obtainable only in remote districts, while several species of the finest of African quadrupeds have totally vanished. One of these is the square-mouthed rhinoceros (*Rhinoceros simus*), none of which has been seen for several years. Another lost species, and one greatly to be regretted, is the true quagga (*Equus quagga*), a magnificent wild horse which originally roamed over South Africa, but was killed off by the Boers, first as food for their black servants, and later for the hides, until it utterly disappeared by 1875 or 1880. An even earlier date had witnessed the extermination of the true or mountain zebra (q.v.), which lingered somewhat longer in the Abyssinian interior, but seems now entirely gone. Several of the larger antelopes have met or seem about to share the fate of these lost horses. The eland has been nearly extirpated by Dutch hide-hunters. The blaubok (*Hippotragus leucophœus*) has long been extinct, and its relatives the magnificent sable and roan antelopes (qq.v.) are growing rare; the white-tailed gnu (q.v.) is on the verge of extinction, except for a few preserved as captives; the bontebok and blessbok (qq.v.) are rapidly approaching the same fate; and the giraffe, on account of its incessant persecution by men in search of its valuable hide, remains numerous only in the remote waterless regions of the northern Kalahari Desert. A monkey (*Colobus Kirki*) of limited distribution on the West Coast and the island of Zanzibar is now supposed to be extinct. See HARTEBEEST.

EXTERMINATION IN AMERICA. The list of the larger animals lost to America since its rediscovery and settlement by Europeans is a long one. Whether or not a native horse lingered in small numbers in South America is a matter of dispute. If there was such an animal, it so quickly disappeared and was replaced by herds of escaped Spanish horses as to have left no trace of itself. The story of the extermination of the bison, of which the only remaining wild remnant at the opening of the twentieth century was a herd of about 250 in the forests north of the North Saskatchewan, is familiar to most readers. (See BISON.) Several marine mammals of our shore have suffered or are doomed to speedy extinction. The case of the rhytina of Bering Sea has been noticed. Its relative, the manatee, is all but extinct in Florida, and rare elsewhere. The fur-seal of the North Pacific (see SEAL) seems likely to die out within a few years, as also does the walrus, now wholly Arctic, except in the neighborhood of Bering Strait. There formerly existed in great numbers along the Californian coast a local sea-elephant (see ELEPHANT SEAL) which until about 1850 furnished profitable sealing. This ended in 1884, when what were probably the last living specimens on the coast were taken at San Cristóbal Island, for preservation in the United States National Museum. The few elephant seals still remaining about Cape Horn represent an expiring race. The West Indian monk seal (*Monachus tropicalis*), once common around the Gulf of Mexico and the Caribbean Sea, had been mainly killed off by 1850, and since then has lingered only on a small group of islets, the Triangles, north of Yucatan, where an accident may easily put an end to the small band.

In respect to birds, the New World has suffered much loss by the changes incident to civilization. The best known case, perhaps, is that of the great auk (see GAREFOWL), which was literally hunted off the face of the earth. It should be said, however, as in several other cases, that this species had a very limited distribution and was waning. Its migrations once extended southward along the west coast of Great Britain to the Bay of Biscay, in Europe; and in America southward to Cape Hatteras. Evidence of this is derived from finding its bones in prehistoric shell-heaps along the coast. It seems to have occasionally visited Norway, but it never was an Arctic bird. Its extermination was no doubt largely effected prehistorically, for within the time of records it has rarely been known to visit even the Hebrides, and its breeding-places were few. It had bred abundantly from time immemorial on the Garefowl Skerries, off the southwest coast of Iceland, and might have remained there yet had not a volcanic disturbance in 1830 destroyed the islets. The survivors fled to Eldey Island, but as this was more accessible, the colony was raided repeatedly by fishermen, and in 1844 the last pair of auks was killed. This ended the history of the garefowl in Europe. How long certain Greenland colonies lasted is not known. In 1534 the men sailing with Jacques Cartier to the discovery of the Saint Lawrence River found on Funk Island, off Cape Bonavista, on the northeastern coast of Newfoundland, a resort of these and other sea-birds, where the 'penguins' (for this term was first applied to this species, and later transferred to the Spheniscidæ) were breeding in thousands. The indiscriminate slaughter of these birds came to an end at an uncertain time, probably about 1840. According to a list published in England in 1888, 79 skins were known to exist, with 10 skeletons and 68 eggs. A third of these are preserved in public museums in various parts of the world, and the remainder are privately owned. When by chance these remains are sold very high and rapidly increasing prices are paid. At a notable auction sale of an ornithological collection in London in 1895, one skin in excellent condition was sold for 360 guineas (about $1800), and an egg brought 180 guineas (about $900). A very complete account of the history of the great auk, together with a full bibliography, may be found in F. A. Lucas's account of his expedition to Funk Island, in 1887, to recover relics of the bird, published in the *Annual Report* of the Smithsonian Institution for 1888.

The next most conspicuous instance of the loss of an American species of bird is the case of the wild or 'passenger' pigeon, which within the last half of the nineteenth century disappeared (but not completely), in a manner not easily accounted for, from a great region in the central United States where previously it had been surpassingly numerous. Its history will be found in the article PIGEON. The Eastern pinnated grouse (see GROUSE and PRAIRIE CHICKEN) survives only in a few examples on the island of Nantucket, which, in spite of legal protection, seem destined to early extinction by semi-wild house-cats. The Carolina parroquet (q.v.) is a small parrot once very common throughout the lower Mississippi Valley, now to be found (if at all) only in a few remote swamps of the Gulf Coast; and the large Cuban macaw (*Ara tricolor*) is supposed to be wholly extinct. Another bird of that region, the ivory-billed woodpecker (q.v.), is probably wholly gone. It is believed that the Antilles and lesser of the West Indian islands have been deprived of many species of birds and other animals since they were first colonized, because recent collectors have been unable to find several species described by early writers, and others have become extremely rare. Newton mentions the loss of a species of petrel (*Æstrelata hœsitata*) of Dominica killed off by a carnivorous marsupial unintentionally introduced into that island; and the mungoos (q.v.) is extirpating a related petrel in Jamaica. Finally, the California condor (q.v.) has been added most lately to the list of vanished American birds, not a single pair apparently remaining, even in the deserts of Lower California.

For the decrease or disappearance of certain fishes, see FISHERIES and FISH CULTURE.

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EXTINCT BIRDS. Various birds may be called 'extinct' instead of 'fossil,' because their species have expired since the present geological era began, or, in several cases, since written records began to be made. In most cases these were birds that belonged to ancient and senescent races, such as the ratite moas (q.v.) and their kindred; or they were species of extremely limited range, or of degenerate powers, due to an insular habitat or other unfavorable surroundings. See EXTINCT ANIMALS.

EXTINCTION OF SPECIES. The extinction of species and higher groups has been due to two causes—first, changes in the physical geography and other environmental conditions of the globe during past geological time, and, second, to changes in the biological environment.

Geological Extinction.—The primary factor, therefore, in the extinction as well as the origin of life-forms is geological changes. If we glance back through the geological ages, we shall see that there were instances of the comparatively rapid extinction of types or whole groups (orders and classes) of animals. The more remarkable were the death and disappearance of the trilobites and ammonites. Darwin remarks: "The extermination of whole groups, as of ammonites toward the close of the Secondary period, has been wonderfully sudden." The trilobites as well as the important order of Eurypterida ceased to exist at the end of the Paleozoic era; the Silurian graptolites, that very considerable group of hydroids, disappeared with comparative suddenness. Coming down to the Mesozoic age, there was a remarkable extinction of types. The greater number of crinoids and brachiopods, and all the dinosaurs and ornithosaurs, as well as the pythonomorphs, these groups comprising the most highly organized reptiles which have ever lived, wholly perished toward or at the close of the Cretaceous period.

It should be borne in mind that these facts of comparatively rapid extinction have nothing in common with the Cuvierian catastrophic doctrine of sudden wholesale extinctions and recreations. But known facts of geology postulate long periods of quiet preparation, succeeded by more or less sudden crises, or radical changes in the physical structure of continents, resulting in catastrophes, both local and general, to certain faunas or group of animals, as well as individual species. These so-called catastrophes, though geologically sudden, may have required thousands of years for accomplishment.

There have been in the course of the earth's history a number of crises or revolutions, which were attended with the loss and extinction of types.

There were enormous changes in the relative distribution of land and sea in pre-Cambrian times. The strata of the lower and upper Huronian are unconformable to each other, the Keweenawan beds are unconformable to the Huronian. Between each two series is an unconformity representing an interval of time long enough for the land to have been raised above the seas, for the rocks to have been folded and to have lost by erosion thousands of feet, and for the land to have sunk below the surface of the ocean. Again, between the pre-Cambrian and Cambrian eras there was a great uplifting and folding of rock, succeeded by long-sustained erosion, over all the continental era.

At the end of the Paleozoic era occurred the Appalachian revolution. This was a period of mountain-building and of continent-making, and on the whole was the most extensive and biologically notable event in geological history. In its effects on life, whether indirect or direct, it was of vastly greater significance than any period since, for contemporaneous with, and as a probable consequence of, this revolution was the incoming of the vertebrates with limbs and lungs, adapted to a terrestrial life. The Appalachians of the Paleozoic times were perhaps as high as the Sierra Nevada or Andean Cordillera of the present time. During this period the cryptogamous forests and their animal life may have been confined to the coastal plains and lowlands, while on the higher, cooler levels may have existed a different assemblage of life; and it is not beyond the reach of possibility that a scanty subalpine flora and fauna peopled the still cooler summits. But this process of mountain-building and erosion was not confined to the end of the Paleozoic era. Since that period there have been along the Atlantic border of the growing and changing continent several successive cycles of denudation extending down to the present time. The great Appalachian plateau with its lofty mountain ranges and peaks rising from the shores of the Atlantic probably presented during the Mesozoic era different climatic zones, from tropical lowlands with their vast swamps, to temperate uplands, stretching perhaps up to Alpine summits. New Zealand at the present day has a subtropical belt of tree-ferns, while the mountains bear glaciers on their summits. The Jurassic was a time of great denudation, when the high ranges of the Appalachian plateau were worn down, and the newly upheaved, tilted, and vaulted beds of the Trias were deeply eroded. During the Cretaceous period this region was a peneplain, the scenic features roughly recalling those of North Carolina and New England at the present day. Then there was a reëlevation, and in the Eocene Tertiary period the swelling and upheaval of the Appalachian dome began again.

We can in imagination see, as the result of these changes in a comparatively restricted portion of the earth's surface, resulting in the formation of separate basins or areas inclosed by mountain ranges, with different climates and zones on land, what a profound influence must have been exerted in the origination and also the extinction of species. In other parts of the world there were corresponding changes. The later revolutions, as those of Tertiary times, were perhaps less marked and extensive. Yet toward the close of this period the great mountain ranges of Asia and Europe, the Alps, Pyrenees, Caucasus, Himalayas, as well as the Atlas of North Africa and the Cordilleras of North and South America were upheaved. The western Alps rose to a height of 11,000 feet, and the Himalayas to a horizon 16,000 feet above the sea, while there were corresponding elevations in western North America and in the Rocky Mountain region.

The last great revolution, which, profound and widespread as it was in the Northern Hemisphere, did not apparently affect life and nature in the tropical zone, was the Glacial period. During this time there was, besides extensive migrations southward, and consequent modifications of species which could not resist the cold, a widespread extinction not only of numberless individuals, but of floras and faunas, a few forms becoming adapted to a circumpolar climate.

Biological Extinction Due to Competition. During all these changes, as the result of the struggle for existence, the competition between the outgoing and the incoming types and floras and faunas, there resulted vast biological changes, i.e. extinctions and re-creations.

In summing up the grand results of the Appalachian revolution and of the times immediately succeeding, Packard states that we should not lose sight of the fact that the changes in the earth's population were due to biological as well as geological and topographical factors. The process of extinction was favored and hastened by the incoming of more specialized forms, many of them being carnivorous and destructive. For example, nearly all fishes and reptiles live on other animals. The struggle for existence between those which became unadapted and useless in the new order of things went on more actively than at present. The process of extinction of the higher, more composite amphibians (the labyrinthodonts) was largely completed by the multitude of theromorphs and dinosaurs which overcame the colossal Cheirotherium, Mastodonsaurus, and their allies. Woodworth also states that "the exact cause of their decline is probably to be sought in the development of the more powerful reptiles." The demise of the ornithosaurs or pterodactyls was assisted, says Packard, in two ways: Those with a feebler flight succumbed to the agile, tree-climbing dinosaurs; while the avian type, waxing stronger in numbers and powers of flight and exceeding in intelligence, exhausted the food-supply of volant insects, and drove their clumsier reptilian cousins to the wall, fairly starving them out; just as at the present day the birds give the bats scarcely a *raison d'être*.

At the close of the Jura-Trias period there was a widespread extinction of the peculiar coniferous plants of the Mesozoic, and they were succeeded by forests of deciduous trees of modern types. Vast forests of deciduous trees, such as the oak, sassafras, poplar, willow, maple, elm, beech, chestnut, and many others, as well as of conifers and palms, clothed the uplands, while in the jungles, on the plains, and in the openings of the forests, gay flowers bloomed. The flora must even then have been, comparatively speaking, one of long existence, because highly differentiated composite plants, like the sunflower, occur in the Upper Cretaceous or Raritan clays of the New Jersey coast.

While the changes of level did not affect the abysses of the sea, the topography of the shallows and coast was materially modified, and to this was perhaps largely due the extinction of the ammonites and their allies.

In 1862 Wood more fully discussed this matter, and mentioned the same cause as suggested by Packard. "This disappearance," says Wood, "of the Ammonitidæ, and preservation of the Nautilidæ, we may infer was due to the entire change which took place in the condition of the shores at the close of the Cretaceous period; and this change was so complete that such of the shore-followers as were unable to adapt themselves to it succumbed, while the others that adapted themselves to the change altered their specific characters altogether. The Nautilidæ having come into existence long prior to the introduction of the Ammonitidæ, and having also survived the destruction of the latter family, must have possessed in a remarkable degree a power of adapting themselves to altered conditions." On the other hand, the dibranchiate cephalopods (cuttles or squids), living in deeper water, being 'ocean-rangers,' were quite independent of such geographical changes. Wood then goes on to say that the disappearance of the tetrabranchiate group affords a clew to that of the Mesozoic saurians, and also of cestraciont sharks, whose food probably consisted mainly of the tetrabranchiate cephalopods. "Now the disappearance of the Tetrabranchiata, of the cestracionts, and of the marine saurians, was contemporaneous; and we can hardly refuse to admit that such a triple destruction must have arisen either from some common cause or from these forms being successively dependent for existence upon each other."

Woodworth suggests that mammalian life in the Mesozoic age was unfavorably affected by the nature of the peneplain of the Atlantic coast and by reptilian life.

"The weak marsupials or low mammals, which first appear in this country with Dromatherium in the tolerably high relief of the Trias, were apparently driven to the uplands by the more puissant and numerous reptilia of the peneplain. Their development seems also to have been retarded." Again he says: "To sum up the faunal history of the Mesozoic alone, we have seen that *pari passu* with the creation of broad lowlands there was brought on to the stage a remarkable production of reptiles, a characteristic lowland life; and we note that the humble mammalia were excluded from the peneplain or held back in their development, so far as we know them by actual remains, during this condition of affairs until the very highest Cretaceous. At the close of the Mesozoic, the area of the peneplain was uplifted and there came into it the new life. Not only the changed geographic conditions, but the better fitted mammalia also were probably factors in terminating the life of the peneplains."

After the placental mammals once became established, as the result of favorable geographical conditions of migration, isolation, and secondarily of competition, the evolution as well as the elimination of forms, as is well known, went on most rapidly. Remains of over two thousand species of extinct mammals during Tertiary times which existed in America north of Mexico have been already described, where at present there are scarcely more than three hundred. This is an example of the amount of extinction which went on in a single class of animals. There must have been corresponding rates of extinction in the case of birds, fishes, and insects.

The rapid summary we have given of the successive changes and revolutions in the earth's history, and the fact that they are accompanied or followed by the process of the extinction of the unadapted, and their replacement by the more specialized and better adapted, show that there is between these two sets of phenomena a relation of cause and effect. The subject is further illustrated by the extinction of life in South America.

The Andean plateau during the Quaternary period was paroxysmally elevated into the air some 12,000 feet. Packard calls attention to the possible results of such an enormous upheaval on the plants and animals of this region. Before and at the time this movement began, when the land was 12,000 feet lower than now, the Atlantic trade winds which now cross Brazil, impinge upon the Andes, and drop their moisture on the eastern slopes alone, then favored as well the western slopes and Pacific coast. The tropical flora and fauna now confined to the neighborhood of Guayaquil on the coast of Peru then probably spread over Bolivia, Ecuador, Peru, and Chile to Patagonia. At Riobamba, altitude 9200 feet, the climate and vegetation are temperate; here occur bones of the mastodon, horse, deer, and llama—animals which may have lived in a temperate climate. But was not their extinction, and that of the colossal sloths, armadillos, and other animals of the pampas largely due to a change of climate resulting from the elevation of the Andean plateau? As the land gradually rose, the atmosphere would become more rarefied and insupportable to tropical life; the animals and plants would either seek lower levels or undergo extinction, or in certain cases become modified into species suited to a temperate climate. As the plateau rose still higher, the air would become too cold and rarefied for even the mastodon and horse. Gradually an alpine zone became established, and finally the higher peaks of the Andes, at an elevation of 15,000 feet, became mantled with perennial snow, and on Chimborazo glaciers established themselves. We thus see how, within Quaternary times, temperate and alpine zones became established over the vast Andean plateau, originally, perhaps at the end of the Pliocene, a plateau of the third order, clothed with vast forests like those of Brazil and Venezuela.

Another, but more local cause of extinction, is seen in Great Salt Lake, Utah. Formerly this was a vast fresh-water lake, abounding in fish, insects, mollusks, and plants. When it was by elevation of the lake-basin transformed into a brine-pool, all life was extinguished, except a shrimp, a single species of fly, and an alga. So with deserts; when they are formed life is reduced to a relatively small proportion.

That there is a limit to the age of species as well as to individuals almost goes without saying. As there is in each individual a youth, manhood, and old age, so species and orders rise, culminate, and decline, and nations have risen, reached a maximum of development, and then decayed. The causes, however complex, are, in the case of plants and animals, apparently physical; they are general and pervasive in their effects, and have been in operation since life began; there have been critical periods in paleontological as well as geological history, and periods of rapid and widespread extinction as well as a continual, progressive dying-out of isolated species. Such extinction was, so to speak, a biological necessity, for otherwise there would have been no progress, no evolution of higher types.

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EXTORTION (ML. *extortio,* Lat. *extorsio,* from *extorquere,* to extort, from *ex,* out + *torquere,* to twist). In its widest sense, any form of taking or obtaining anything from another by means of illegal compulsion or oppressive exaction. As a technical term of the common law it has been judicially defined as the "crime committed by an officer of the law, who under color of his office unlawfully and corruptly takes any money or thing of value that is not due to him, or more than is due, or before it is due." It is by the common law a misdemeanor punishable by fine and imprisonment, and subjecting the offender to removal from office. In most of the United States the term has received statutory definition. For example, in New York it is defined as "the obtaining of property from another, with his consent, induced by a wrongful use of force or fear, or under cover of official right." (New York Penal Code, § 552.) See *Encyclopædia of Pleading and Practice,* viii. (Northport, 1897).

EXTRACT (ML. *extractus,* extract, from Lat. *extractus,* p.p. of *extrahere,* to draw out, from *ex,* out + *trahere,* to draw). In a medical or pharmaceutical sense, any vegetable preparation obtained by treating a plant with a solvent and evaporating the solution to about the consistency of honey; or by expressing the juice of the plant and evaporating—forming respectively liquid and solid extracts. Extracts contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and at the same time are not so volatile as to be lost during evaporation. Now, as many extractive matters are more or less volatile, it makes a great difference whether the operation is conducted at a low or at a high temperature. Extracts are called watery or aqueous, alcoholic, or ethereal, according to the menstruum employed. Different plants of course afford different extracts, some being of the nature of bitters, others being used as pigments, tanning substances, etc. Extracts are liable to great uncertainty in point of strength and composition, and require to be prepared with great care.

Evaporation in vacuo is found to be a great improvement, as it may be effected at relatively low temperatures.

EXTRACT OF MEAT. An extract obtained by treating chopped meat with cold water, then very gradually raising the temperature, when about one-eighth of the weight of the meat is dissolved, leaving an almost tasteless insoluble fibrine. (See Beef Tea; Broth.) It may be concentrated into small bulk, and, when desired, may be afterwards treated with water, and being heated, forms an agreeable, light, and nutritive soup. The market is supplied with many brands of concentrated beef extract, prepared by special patented processes. The pioneer in this work was the chemist Liebig. See Meat Extract; Food, Preservation of.

EXTRA CURRENT. See Electricity.

EXTRADITION (from Lat. *ex*, out + *traditio*, delivery, from *tradere*, to give over). The delivery up by one State or nation to another of a fugitive from justice. Strictly speaking, extradition is a modern practice, although Hannibal's delivery was stipulated for in a Roman treaty, and more than once Roman citizens were surrendered to a foreign power. These acts, like many others in ancient, mediæval, and early modern times, were confined to those who were considered enemies of the State. The right to deny the privilege of asylum was a prerogative of the sovereign, and sovereigns frequently used it so as best to secure their personal interests. Thus extradition was confined to what we should now call political offenses.

It is mainly within the last hundred years that a deeper international comity has developed. Increased intercourse and modern means of transportation have greatly facilitated flights from justice, while a sense of common interest has done much to diminish international jealousy and distrust. Each decade it has become more evident that the failure of civil justice in one country is likely to result unfavorably to its neighbor. No country has ever willingly received the convicts of another, and it was possible that nations with liberal ideas should long fail to perceive that there was no great difference between encouraging crime and furnishing an asylum for fugitives from justice. If, then, there was a common national interest in the punishment of criminals, and if offenders against foreign laws were undesirable immigrants, extradition was both an advantage and a duty.

The great writers on international law have not been in harmony on the question as to whether extradition is, in the absence of agreement, a matter of international obligation. Some of the ablest have argued in the affirmative, but the modern writers, like Bluntschli, Fiore, Phillimore, Woolsey, Hall, and Moore, who have so successfully labored to place the law of nations on a sound legal basis, are agreed that the obligation is a purely moral one. But the wisdom of the practice is generally recognized, as is the principle that, owing to the great difference between the political systems and penal codes of different nations, it was better for them to give their mutual obligations in this respect definite expression in treaties. Clarke, the leading English writer on extradition, states that its history in England begins with the Ashburton Treaty of 1842 with the United States. Excepting the Jay Treaty of 1794, which contained an article on extradition limited to twelve years, all the other treaties covering this subject made by the United States are of a subsequent date. The two conventions between the United States and Great Britain, in 1842 and 1890, show what offenses two leading nations of to-day consider extraditable. The former covered the crimes of murder, assault with intent to commit murder, piracy, arson, robbery, forgery, and the utterance of forged papers; the latter added voluntary manslaughter, counterfeiting, or altering money, etc., embezzlement, larceny, etc., fraud by a bailee, banker, etc., perjury or subornation of perjury, rape, abduction, child-stealing, kidnaping, burglary, etc., piracy by the law of nations, revolt or conspiracy to revolt by two or more persons on board a ship on the high seas, etc., crimes and offenses against the laws of both countries for the suppression of slavery and slave-trading.

The tendency is to enlarge the list of extraditable crimes, but there are many offenses which, for obvious reasons, cannot properly be included. Such are political crimes and offenses against religion and marriage laws. As the customs laws of each nation are leveled against the interests of all others, it would be absurd to add offenses against them to the number of extraditable crimes. The general rule is that an extraditable crime must be one commonly recognized by civilized nations as a *malum in se*, and not merely *malum prohibitum.*

The method and prerequisites of extradition may, perhaps, best be shown by a quotation from the Ashburton Treaty. It provides that the two Powers shall, upon mutual requisitions, deliver up to justice all persons charged with the commission of certain crimes, "provided that this shall only be done upon such evidence of criminality as, according to the laws of the place where the fugitive or person so charged shall be found, would justify his apprehension and commitment for trial if the crime or offense had there been committed; and the respective judges and other magistrates of the two governments shall have power, jurisdiction, and authority, upon complaint made under oath, to issue a warrant for the apprehension of the fugitive or person so charged, that he may be brought before such judges or other magistrates respectively, to the end that the evidence of such criminality shall be heard and considered; and if, on such hearing, the evidence be deemed sufficient to sustain the charge, it shall be the duty of the examining judge or magistrate to certify the same to the proper executive authority, that a warrant may issue for the surrender of such fugitive." The complaint under oath is commonly made by a consular officer of the State asking for extradition. If all the proceedings are satisfactory, the President of the United States (in our practice) causes the surrender to be made to the agent of the demanding Power. The expenses are borne by the party making the requisition.

There are two limitations on the practice of extradition which are worthy of notice. (1) It is an almost universal rule that a State will not surrender its own citizens to a foreign Power. This is due to the national sentiment that leads each nation to regard its own laws and administration of justice as superior to those of foreign Powers, and to the equally natural desire to give its own citizens the benefit of those laws. As most civilized States assert a jurisdiction over their citizens for crimes committed abroad, this exception is readily admitted as a qualification upon the right of extradition. (2) It is generally regarded as an abuse of the principle of extradition for a State to secure the rendition of a criminal for an extraditable offense, and then to try and punish him for an offense not included in the treaty. The question as to whether a person extradited for one offense may be tried for another has frequently arisen. The authorities give many instances of prosecutions for other offenses than those named in the requisitions. In 1870 the British Parliament passed a law forbidding the surrender of any fugitive without a positive pledge from the receiving State that he should not be tried for any other offense than that specified in the requisition for extradition until after he had had an opportunity of returning to her Majesty's dominions. Although the United States, during the secretaryship of Hamilton Fish, took serious exception to the application of this law to the famous Winslow case, the principle now receives general recognition.

From the fact that difficulties in regard to extradition are most satisfactorily anticipated by treaties, it should not be inferred that extradition has not taken place without them. Spain and other countries having no treaty of extradition with Great Britain have surrendered criminals upon her requisition. The rule in the United States is neither to ask nor to grant extradition in the absence of a treaty, but this country has not disdained to accept this evidence of international comity from other States—as when Spain of her own volition surrendered the notorious William M. Tweed to the New York authorities in 1876—and has acted on the principle herself in the surrender of Arguelles to Spain in 1863, and in other cases.

The law of extradition between the different States of the United States is laid down in Art. IV., sec. 2 of the Constitution, and in a law of Congress of February 12, 1793. The former reads: "A person charged in any State with treason, felony, or other crime, who shall flee from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up, to be removed to the State having jurisdiction of the crime." The latter provides for the form in which the demand shall be made, whereupon it shall be the duty of the Governor to whom it is addressed to cause the fugitive to be arrested and delivered over to the agent of the other State. The prerequisites of a valid demand are a formal charge that a crime has been committed against the laws of the demanding State, and that the person charged has fled to the State on whose executive the demand is made. Although there have been some striking exceptions, the better opinion is that the Governor on whom the demand is made has no option in the matter, although the alleged offense may not be a crime in the State where the fugitive has sought an asylum.

The United States has made treaties of extradition with the following named countries:

COUNTRIES	When concluded
Austria	July 3, 1856
Baden	Jan. 30, 1857
Bavaria	Sept. 12, 1853
Belgium *	Mar. 19, 1874
	June 13, 1882
Bremen	Sept. 6, 1853
Dominican Republic	Feb. 8, 1867
Ecuador	June 28, 1872
France	Nov. 9, 1843
	Feb. 24, 1845
	Feb. 10, 1858
	1893
Great Britain	Nov. 19, 1794†
	Aug. 9, 1842
	July 12, 1889
Hanover ‡	Jan. 18, 1855
Hawaiian Islands	Dec. 20, 1849
Haiti	Nov. 3, 1864
Italy §	Mar. 23, 1868
	Jan. 21, 1869
	June 11, 1884
Japan	Apr. 29, 1886
Luxembourg	Oct. 29, 1883
Mecklenburg-Schwerin	Nov. 26, 1853
Mecklenburg-Strelitz	Dec. 2, 1853
Mexico	Dec. 11, 1861
Netherlands ‖	May 22, 1880
	June 2, 1887
Nicaragua	June 25, 1870
North German Union	Feb. 22, 1868
Oldenburg	Dec. 30, 1853
Orange Free State	Dec. 22, 1871
Ottoman Empire	Aug. 11, 1874
Peru ¶	Sept. 12, 1870
Prussia and other States of the Germanic Confederation	June 16, 1852
Russia	1893
San Salvador	May 23, 1870
Schaumburg-Lippe	June 7, 1854
Spain **	Jan. 5, 1877
	Aug. 7, 1882
Sweden and Norway	Mar. 21, 1860
	1893
Swiss Confederation	Nov. 25, 1850
Two Sicilies ††	Oct. 1, 1855
Venezuela ‡‡	Aug. 27, 1860
Württemberg	Oct. 13, 1853
	July 27, 1868

* Replaced by treaty of 1882.
† Expired October 28, 1807.
‡ Terminated by absorption of Hanover by Prussia.
§ Amended by treaties of 1869 and 1884.
‖ Replaced by treaty of 1887.
¶ Terminated March 31, 1886.
** Amended by treaty of 1882.
†† Replaced by treaty of 1868, with Italy, and its amendments.
‡‡ Terminated October 22, 1870.

Consult: Moore, *Treatise on Extradition and Interstate Rendition* (Boston, 1891); Hawley, *Interstate Extraditions* (Detroit, 1890); Spear, *Law of Extraditions, International and Interstate* (2d ed., Albany, 1884); Rorer, *American Interstate Law* (Chicago, 1879); and the authorities referred to under INTERNATIONAL LAW.

EX'TRALITE. See EXPLOSIVES.

EXTRAORDINARY RAY. See LIGHT.

EXTRATERRITORIALITY. A principle of international law by which certain classes of persons residing in a foreign country are exempted from its jurisdiction. This immunity extends to sovereigns passing through a foreign country, to diplomatic agents, to a man-of-war in a foreign port, and the like; it finds its reason in the spirit of international comity, and it is based on the legal fiction that such privileged persons carry with them the laws of their own country, the residence of an ambassador or the deck of a man-of-war being regarded as a part of the soil of the country whose flag they fly. See Exterritoriality.

EXTRAV′AGAN′TES CON′STITU′TIO′NES (Lat., extravagant constitutions). Papal constitutions of John XXII. and some of his successors, supplemental to the 'Corpus Juris Canonici.' They got their name from the fact that they were not arranged in order with the other constitutions, but were 'outside wanderers' from the general code.

EXTRAVAGAN′ZA (It., extravagance). A musical or dramatic piece of great wildness or absurdity, characterized by extravagant and fantastic qualities. The term is often applied to any extravagant piece of writing, such as Thackeray's *Novels by Eminent Hands.*

EXTRAVASA′TION (from ML. *extravasatus*, extravasated, from Lat. *extra*, beyond + *vas*, vessel). The escape of any of the fluids of the living body from their proper vessels through a rupture or injury in their walls. Excrementitious matter thus sometimes escapes into the abdomen through a wound or ulceration of the bowels. But the term is oftenest used in speaking of the escape of blood from injured blood-vessels. Extravasation is distinguished from exudation by this, that in the last the vessels remain entire, and the effusion takes place by filtration through their walls; nor does more than a part of the blood so escape, the blood-globules being retained, while in extravasation entire blood is effused. Many kinds of extravasation are rapidly fatal, such as that of urine or of gall into the abdomen, or of blood from the vessels of the brain in many cases of apoplexy. The dark color resulting from a bruise is owing to extravasated blood from lacerated capillaries.

EXTREME UNCTION (Lat. *extrema unctio*). A sacrament of the Roman Catholic Church, which, as the other sacraments supply spiritual aid in the various circumstances of life, is believed to impart to the Christian grace and strength to encounter the struggle, as well spiritual as bodily, of the dying hour. The rite of unction or anointing in different forms is common to several of the sacraments; the name 'extreme' is given to that of the present sacrament because it is reserved for the last act of the Christian career. The Council of Trent declares this sacrament, although 'promulgated' in the well-known passage of Saint James v. 14, 15, to have been 'instituted' by Christ. The fathers frequently allude to the rite of unction, and although many of these allusions certainly refer to the unctions of baptism and confirmation, yet Catholics rely on several passages of Origen, Chrysostom, Cæsarius of Arles, and Pope Innocent I. as decisive regarding the unction of the dying, as also upon the fact that in the various separated churches of Oriental Christians—Greek, Coptic, Armenian, and Nestorian—the rite is found, although with many ceremonial variations. In the Roman Catholic Church the sacrament is administered by the priest, who, "dipping his thumb in the holy oil, anoints the sick person, in the form of the cross, upon the eyes, ears, nose, mouth, hands, and feet, at each anointing making use of this form of prayer: 'Through this holy unction, and His most tender mercy, may the Lord pardon thee whatever sins thou hast committed by thy sight. Amen." And so of the hearing and the rest, adapting the form to the several senses. Extreme unction is reputed by Catholics one of the sacraments 'of the living'; that is, it ordinarily requires that the recipient should be in a state of grace, or, in to the several senses. Extreme unction is remission of his sins by absolution or by perfect contrition; but it is held to remit, *indirectly*, actual sins not previously remitted, and also (although not infallibly, but according to the merciful designs of Providence) to alleviate, and even to dispel, the pains of bodily disease. The holy oil which forms the 'matter' of this sacrament must be blessed by the bishop—a ceremony which is performed with great solemnity once each year by the bishop, attended by a number of priests, on Maundy Thursday. The oil so blessed is reserved for use during the year. Formerly several priests united in the administration of the sacrament, and the custom is still maintained in the Greek Church; among Roman Catholics one priest now administers it. The Greek form of words also differs, although not substantially, from that of the Latin Church. The Greeks call this sacrament 'the holy oil,' and sometimes 'the oil of prayer.' Consult: Schanz, *Die Lehre von den heiligen Sacramenten* (Freiburg, 1893); Schmitz, *De Effectibus Sacramenti Extremæ Unctionis* (Freiburg, 1893). See Unction.

EXUMAS, ĕks-o͞o′mȧz. An archipelago in the British West Indies, part of the Bahamas (q.v.), between Andros and Long Island (Map: West Indies, J 3). It comprises the islands of Great Exuma, Little Exuma, and the Exuma Keys, occupying a total area of about 100 square miles. Little Exuma has one of the best harbors in the Bahama group. The inhabitants are employed partly in agriculture, but chiefly in salt-making. The population of the group is estimated at 2300.

EYAS, ī′as. See Falconry.

EYBE, ī′be, Albrecht von (1420-75). A German writer, born in Franconia. He studied at Pavia, became Archdeacon of Würzburg in 1449, and later entered the service of Pope Pius II. His work on marriage, entitled *Ehestandsbuch* (1472), has frequently been reprinted. The most recent editions are those of K. Müller (Sondershausen, 1879) and Herrmann (Berlin, 1890).

EYCK, īk, Huybrecht (Hubert), (c.1370-1426), and Jan (John), van (c.1390-1440). Brothers, Flemish painters, founders of the schools of painting of the Netherlands and in Germany. Their fame rests upon two of the greatest services to modern art that it is possible to conceive—namely, the invention of an improved technique of oil painting, which caused its universal adoption, and the introduction of naturalism into modern art. The Van Eycks first mixed their colors upon the palette, obtaining clear, transparent hues—a proceeding so advantageous that it was speedily introduced into the Netherlands, into Germany, and into Italy. But even more important was the introduction of naturalism into modern art. Before their time painting had been conventional; architecture was used as a decoration only, and there were practically no landscapes. The Van Eycks were the first to paint things exactly as they saw them. Their Madonnas and saints were Flemish men and women, clothed in the costume of the day. They appeared in real Gothic churches and houses, or in landscapes containing actual trees and walled cities.

The brothers Van Eyck take their name from a little town on the Maas, near Maastricht, called Maaseyck, where they were born. The dates of their birth are unknown, Hubert's being variously assigned from 1366 to 1375, and Jan's from 1386 to 1400. Of Hubert we only hear that in 1421-22 he was a member of a religious guild at Ghent, where he lived. He executed work for the magistrates of Ghent, who in 1424 visited his studio in state. They perhaps came to see the great altar which the rich burgher Jodocus Vydt, Lord of Pamele, had ordered for his chapel in the Church of Saint Bavon. Hubert did not live to finish this work, but died on September 18, 1426, and was buried in the crypt directly under the chapel he had been asked to decorate. As regards the life of Jan we are better informed. He was probably the pupil of his brother, who much exceeded him in years. From 1422 till 1424 he was in the service of John of Bavaria, then living as Count of Holland at The Hague, and in 1425 he was appointed Court painter and 'valet de chambre' (a sort of chamberlain), with a salary of 100 livres a year, to Philip the Good, Duke of Burgundy. He lived at Lille with the Duke, who employed him upon various diplomatic missions. In 1428-29 he was one of the embassy sent to Lisbon to negotiate the marriage of the Princess Isabella of Portugal to his master, and during his stay in Portugal he became acquainted with the southern vegetation which appears in his pictures. He made a pilgrimage to San Iago di Campostella, and visited the Alhambra. After his return to Flanders he retired to Bruges, and there he finished the altarpiece which his brother had left incomplete, on May 6, 1432. In 1436 he was sent upon another distant diplomatic mission. He died at Bruges on July 9, 1440, and lies buried in the Church of Saint Donatus.

The Vydt altar in the Church of Saint Bavon, now the Cathedral of Ghent, is the masterpiece of the brothers Van Eyck. It was a large triptych containing twenty-eight different panels portraying the central dogma of the Christian religion—the "Redemption from Sin through the Sacrifice of the Lamb." Both exterior and interior of the altar were painted. The Predella, now lost, represented "Purgatory"; upon the upper part of the exterior of the closed wings was the "Annunciation," and above it the prophets "Micah" and "Zachariah" and the "Two Sibyls," who foretold the event. In the centre, below the "Annunciation," were "John the Baptist" and "John the Evangelist," the patrons of the church, painted like contemporary stone statues, and on either side of them the kneeling figures of the donors, Jodocus Vydt and Isabella Burlunt, his wife—portraits of admirable realism. The interior of the altar, opened only on great occasions, revealed the mystery of faith for which the exterior prepared us. The largest central panel is the "Sacrifice of the Lamb."

The part taken by the two brothers in this great work is a subject of much controversy. The general plan is due to Hubert, but most of the execution to Jan. From Jan's other works we know that his art was very minute and realistic, and it is reasonable to suppose that Hubert, who was much older, approximated more closely to the ancient manner, which was more monumental. Applying this criterion to the Ghent altar, the central figures of the "Almighty," the "Virgin," and "John the Baptist" must be assigned to Hubert, and probably the "Hermits" and "Pilgrims" as well. Some also ascribe to him a part at least of the "Adoration of the Lamb." Although none of Hubert's other works survive, these alone are sufficient to prove him a painter of great importance, as is also evident from the tribute of his brother Jan in an inscription of the altar.

The Ghent altar was held in the highest repute, both when it was executed and in the centuries following. It survived the Burgundian wars and the iconoclastic riots of the Reformation. Philip II. in vain attempted to acquire it for Spain, but had to content himself with a copy finished by Michel Coxie (q.v.) in 1559. The original was taken, in part, to Paris during the French Revolution, but was returned to Ghent. After its return the wings were sold, and are in the Museum of Berlin, except "Adam" and "Eve," two nude figures at the end of the altar, which are now at Brussels. The central panels are in their original position, the wings being supplied by Coxie's copies.

A large number of paintings are ascribed to Jan in the different European galleries, but many of these are works of his school. Some of them are signed and dated. The earliest of these is the "Consecration of Thomas à Becket as Archbishop of Canterbury" (1421), belonging to the Duke of Devonshire, at Chatsworth House, the authenticity of which has been disputed. There is a charming little Madonna (1432), characteristic of his early work, at Ince Hall, near Liverpool. The National Gallery (London) has three good portraits—the "Scholar," the "Man with a Turban" (1433), and the newly married "Giovanni Arnolfini and His Wife," a wonderful piece of realism. At Paris there are "Madonna with the Child," in the Rothschild Collection, and the "Madonna of the Chancellor Rollin," in the Louvre. The Antwerp Museum possesses "Saint Barbara" (1439), while that at Bruges has the "Madonna of Canon George van der Pael" and the portrait of "The Artist's Wife" (1439). In Vienna are the portraits of the "Old Man in a Red Coat" and "Jan de Leeuw," and at Frankfort is a delightful "Madonna Suckling the Child" of the early period. At Dresden there is a small triptych, which, according to the legend, was used by Charles V. on his travels. The central panel shows the Madonna in a beautiful Gothic chapel; on one wing are "Saint Michael" and the "donor," on the other "Saint Catherine." The Berlin Museum is richest of all in works of Jan van Eyck. Besides the part of the Ghent altar, and other works of more doubtful authenticity, it possesses a "Head of Christ," in a style like that of Hubert; a portrait of "Giovanni Arnolfini"; and the "Man with the Pinks"—one of the artist's finest portraits. The Metropolitan Museum, New York, has two works ascribed to him, of which the "Madonna of the Baldachin" may be original.

A chief characteristic of Jan van Eyck's works is their detailed finish, almost like the miniatures of a manuscript. His pictures are like exquisitely wrought jewels. Such detail, of course, precludes emphasis, which is only in part atoned for by its beauty and delicacy. His realism, as evinced in such figures as "Adam" and "Eve," must have been a revelation to contemporaries. His landscapes are well selected, and, like his interiors, form admirable backgrounds for his pictures, giving unity to the composition. He did not understand linear perspective, but rendered atmospheric gradations with great skill, and understood to a remarkable degree the handling of light and shade. Most charming of all is his color—bright, but in a low key, and pervaded by reddish-brown tone, full of light. He was an excellent draughtsman.

A school seems to have grown up around Jan van Eyck at Bruges, but none of his pupils were as important as the master, although there were good artists among them. The best were Petrus Christus, Rogier van der Weyden, Hugo van der Goes, Justus van Ghent. (See articles on these artists.) His sister, MARGERETA VAN EYCK, was also a painter, but of her work nothing is known. Waagen thinks that she painted the miniatures of the breviary of the Duke of Bedford, Regent of France, in the Bibliothèque Nationale, Paris. A third brother, LAMBERT VAN EYCK, has been discovered in a book of expenses of Philip the Good, but there is nothing to prove, although this has been surmised by critics, that he was a painter.

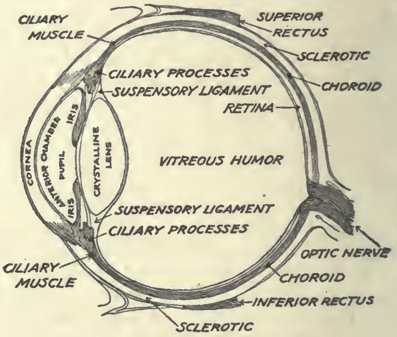
BIBLIOGRAPHY. The chief source of information on the Van Eycks is Karel von Mander's *Schilderboeck* (Haarlem, 1604); the author was the Vasari of Flemish and Dutch art, and had many sources of information, both documentary and traditional, now lost. This information is supplemented by occasional entries in contemporary documents. Of modern authorities the best are: Waagen, *Hubert and Johann van Eyck* (Breslau, 1822); Crowe and Cavalcaselle, *Lives of the Early Flemish Painters* (London, 1876); Hotho, *Die Malerschule Huberts van Eyck* (Berlin, 1855-58); Lalaing, *Jean van Eyck* (Lille, 1887); Kämmerer, "Hubert and Jan van Eyck," in Knackfuss, *Künstler-Monographien* (Bielefeld, 1898); and Voll, *Die Werke des Jan van Eyck* (Strassburg, 1900).

EYCKENS, ī′kĕns. See YKENS.

EYE (AS. *ēage*, Goth. *augō*, OHG. *ouga*, Ger. *Auge*, Lat. *oculus*, eye, Gk. ὄσσε, *osse*, the two eyes, OChurch Slav. *oko*, Skt. *akṣan*, eye). The organ of sight. In this article we shall consider the structure of the human eyeball, and of certain accessory parts or appendages which serve to protect that organ, and are essential to the due performance of its functions.

The *globe of the eye* is placed in the anterior part of the cavity of the orbit (q.v.), in which it is held in position by its connection with the optic nerve posteriorly, and with the muscles which surround it, and by the eyelids in front. It is further supported behind and on the sides by a quantity of loose fat, which fills up all the interstices of the orbit and facilitates the various movements of which the eye is capable. The form of the eyeball is nearly spherical; but on viewing the organ in profile we see that it is composed of segments of two spheres of different diameters. Of these the anterior, formed by the transparent cornea, has the smaller diameter, and is therefore the most prominent, and hence the antero-posterior slightly exceeds (by about a line) the transverse diameter. The radius of the posterior or sclerotic segment is about nineteen-fortieths, and that of the anterior segment about thirteen-fortieths of an inch. When the eyes are in a state of repose, their antero-posterior axes are parallel; the optic nerves, on the other hand, diverge considerably from their commissure within the cavity of the skull to the point where they enter the globe; consequently, their direction does not coincide with that of the eye. Each nerve enters the back of the globe at a distance of about one-eighth of an inch on the inner side of the antero-posterior axis of the eye.

The eyeball is composed of several investing membranes and of certain transparent structures which are inclosed within them, and which, together with the cornea, act as refractive media of various densities upon the rays of light which enter the eye.



SECTION OF EYEBALL.

The outermost coat of the eye is the *sclerotic* (from Gk. σκληρός, *sklēros*, hard). It is a strong, dense, white, fibrous structure, covering about four-fifths of the eyeball, and leaving a circular deficiency anteriorly, which is occupied by the cornea. Posteriorly, it is perforated by the optic nerve, and it is there continuous with the sheath which that nerve derives from the dura mater, the fibrous investment of the brain and spinal cord. Near the entrance of the nerve, its thickness is about one-twentieth of an inch; from this it diminishes to about one-fortieth; but in front it again becomes thicker, from the tendinous insertions of the straight muscles which blend with it. This coat, by its great strength and comparatively unyielding structure, maintains the inclosed parts in their proper form and serves to protect them from external injuries.

The *cornea* (so called from its horny appearance) is a transparent structure, filling up the aperture left in the anterior part of the sclerotic. Its circumference is overlain by the free edge of the sclerotic, which in some parts presents a groove, so as to retain it more firmly; and the connection by continuity of texture between the two structures is so close that they cannot be separated in the dead body without considerable maceration. The cornea, in consequence of its greater convexity, projects beyond the line of the sclerotic; the degree of convexity, however, varies in different persons and at different periods of life. It is thicker than any part of the sclerotic, and so strong as to be able to resist a force capable of rupturing that tunic. Although beautifully transparent and appearing to be homogeneous, it is in reality composed of five layers, clearly distinguishable from one another—viz. (proceeding from the front backward): (1) The conjunctival layer of epithelium. It is in this epithelium that particles of iron, stone, etc., forcibly driven against the eye usually lodge, and it is a highly sensitive membrane. (2) The anterior elastic lamina forming the anterior boundary of the cornea proper; it is not more than one two-thousandth of an inch in thickness, and its function seems to be that of maintaining the exact curvature of the front of the cornea. (3) The cornea proper, on which the thickness and strength of the cornea mainly depend. (4) The posterior elastic lamina, which is an extremely thin membrane, in which no structure can be detected. It probably contributes, like the anterior lamina, to the exact maintenance of the curvature of the cornea, so necessary for correct vision. (5) The posterior endothelium of the aqueous humor, which is probably concerned in the secretion of that fluid. For further details regarding these different layers, the reader is referred to Prudden, *A Manual of Practical Normal Histology* (New York, 1886).

The *choroid coat* is a dark-colored vascular membrane, which is brought into view on the removal of the sclerotic. Its outer surface, which is nearly black, is loosely connected with the sclerotic by connective tissue, in which are contained certain nerves and vessels (termed the ciliary nerves and vessels) which go to the iris. Its inner surface is soft, villous, and dark-colored. In front it is attached to the membrane of the vitreous humor by means of the ciliary processes, which consist of about sixty or seventy radiating folds. These are alternately long and short, and each of them is terminated by a small, free, interior extremity, and they are lodged in corresponding folds in the membrane of the vitreous humor. In other parts it is loosely connected with the retina. The choroid is composed of minute ramifications of vessels—especially of veins which, from their whorl-like arrangement, are termed *vasa vorticosa*—of connective tissue, and of pigment-cells, which usually approximate to the hexagonal form and are about one one-thousandth of an inch in diameter. In albinos this pigment is absent, and hence their eyes have a pink appearance, which is due to the unconcealed blood in the capillaries of the choroid and iris. See ALBINO.

The *iris* may be regarded as a process of the choroid, with which it is continuous, although there are differences of structure in the two membranes. It is a thin, flat, membranous curtain, hanging vertically in the aqueous humor in front of the lens, and perforated by the pupil for the transmission of light. It divides the space between the cornea and the lens into an anterior (the larger) and a posterior (the smaller) chamber, these two chambers freely communicating through the pupil. The outer and larger border is attached all round to the line of junction of the sclerotic and cornea, while the inner edge forms the boundary of the pupil, which is nearly circular, lies a little to the inner side of the centre of the iris, and varies in size according to the action of the muscular fibres of the iris, so as to admit more or less light into the interior of the eyeball, its diameter varying, under these circumstances, from about one-third to one-twentieth of an inch. It is muscular in its structure, one set of fibres being arranged circularly round the pupil, and, when necessary, effecting its contraction; while another set lies in a radiating direction from within outward, and by its action dilates the pupil. These fibres are of the unstriped and involuntary variety. The nerves which are concerned in these movements will be presently noticed.

The *ciliary muscle* is a thin band or ring of non-striated muscular fibres which lies between the iris and the choroid. Its posterior attachment is to the anterior margin of the choroid, while anteriorly it is attached by an annular ligament to the outer margin of the iris and to the adjacent portions of the cornea and sclera. By the contraction of this muscle the choroid is drawn forward, the suspensory ligament of the *lens* is relaxed, and *accommodation* of the eye is effected.

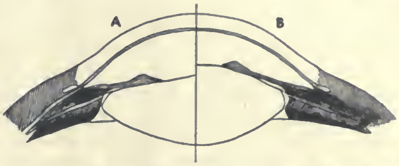


DIAGRAM ILLUSTRATING THE MECHANISM OF ACCOMMODATION OF THE EYE.

In B the lens is accommodated for near objects; in A it is accommodated for objects at a distance.

The varieties of color in the eyes of different individuals, and of different kinds of animals, mainly depend upon the color of the pigment which is deposited in cells in the substance of the iris.

Within the choroid is the *retina*, which, although continuous with the optic nerve—of which it is usually regarded as a cup-like expansion—differs very materially from it in structure. Before noticing the elaborate microscopical structure of this part of the eye, we shall briefly mention those points regarding it which can be established by ordinary examination. It is a delicate semi-transparent sheet of nervous matter, lying immediately behind the vitreous humor, and extending from the optic nerve nearly as far as the lens. On examining the concave inner surface of the retina at the back of the eye, we observe, directly in a line with the axis of the globe, a circular yellow spot called 'macula lutea,' and known, after its discoverer, as 'the yellow spot of Sömmering,' of about one-twentieth of an inch in diameter. As there has been much discussion regarding the structure and function of this spot, we may observe that Dr. Todd and Mr. Bowman, two of the most eminent English microscopists, after several examinations, regard it as a small mound or projection of the retina toward the vitreous humor, with a minute depression in the summit. The only mammals in which it exists are man and the monkey. It is the area of most distinct vision—a circumstance which may partly be accounted for by the fact that it is singularly free from blood-vessels, which curve round it and apparently avoid it. The structure of the retina, as revealed by the microscope, is in the highest degree remarkable. Although its greatest thickness (at the entrance of the optic nerve) is only about $\frac{1}{20}$ of an inch, and as it extends anteriorly it soon diminishes to $\frac{1}{200}$ of an inch, the following layers from without inward may be distinguished in all parts of it: (1) The layer of rods and cones, frequently termed, from its discoverer, the *membrane of*

Jacob; (2) the external limiting membrane; (3) the outer nuclear layer; (4) the outer molecular layer; (5) the inner nuclear layer; (6) the inner molecular layer; (7) the layer of ganglion-cells; (8) the layer of nerve-fibres; (9) the internal limiting membrane.

It now remains for us to describe the *transparent media* which occupy the interior of the globe, and through which the rays of light must pass before they can reach the retina and form on it the images of external objects. We shall consider them in the order in which the rays of light strike them.

Immediately behind the transparent cornea is the *aqueous humor,* which fills up the anterior and posterior chambers which lie between the cornea and the lens. As its name implies, it is very nearly pure water, with a mere trace of albumen and chloride of sodium. As no epithelium exists in front of the iris, or on the anterior surface of the lens, it is most probably secreted by the cells on the posterior surface of the cornea.

The *crystalline lens* lies opposite to and behind the pupil, almost close to the iris, and its posterior surface is received into a corresponding depression on the fore part of the vitreous humor. In form, it is a double-convex lens, with surfaces of unequal curvature, the posterior being the most convex. It is inclosed in a transparent capsule, of which the part covering the anterior surface is nearly four times thicker than that at the posterior aspect, in consequence, doubtless, of greater strength being required in front, where there is no support, than behind, where the lens is adherent to the vitreous membrane. The microscopic examination of the substance or body of the lens reveals a structure of wonderful beauty. Its whole mass is composed of extremely minute, elongated, ribbon-like structures, commonly called the *fibres of the lens,* which are developed from cells. These fibres are arranged side by side in lamellæ, of which many hundred exist in every lens, and which are so placed as to give to the anterior and posterior surfaces the appearance of a central star, with meridian lines. The lens gradually increases in density, and at the same time in refracting power, toward the centre; by this means the convergence of the central rays is increased, and they are brought to the same focus as the rays passing through the more circumferential portions of the lens. (According to Brewster, the refracting power at the surface is 1.3767, and at the centre 1.3990.) The lens contains 58 per cent. of water, 36 of albumen, with minute quantities of salts, membrane, etc. In consequence of its proteid constituent, it becomes hard and opaque on boiling, as we familiarly see in the case of the eyes of boiled fish. In the adult its long diameter ranges from one-third to three-eighths, and its antero-posterior diameter from one-eighth to one-sixth of an inch, and it weighs three or four grains.

The *vitreous humor* lies in the concavity of the retina, and occupies about four-fifths of the eye posteriorly. It is inclosed in the hyaloid membrane, which sends numerous processes inward, so as to divide the cavity into a series of compartments, and thus to equalize the pressure exerted by the inclosed soft, gelatinous mass. Between the anterior border of the retina and the border of the lens, we have a series of radiating folds or plaitings termed the *ciliary processes of the vitreous body,* into which the *ciliary processes of the choroid* dovetail. The vitreous humor contains 98.4 per cent. of water, with a trace of albumen and salts, and hence, as might be expected, its refractive index is almost indentical with that of water.

The appendages of the eye now claim our notice. The most important of these appendages are the *muscles within the orbit,* the *eyelids,* the *lachrymal apparatus,* and the *conjunctiva,* to which (although less important) we may add the *eyebrows.*

The *muscles* by which the eye is moved are four straight (or *recti*) muscles, and two oblique (the superior and inferior). The former rise from the margin of the optic foramen at the apex of the orbit, and are inserted into the sclerotic near the cornea, above, below, and on either side. The superior oblique arises with the straight muscles; but, after running to the upper edge of the orbit, has its direction changed by a pulley, and proceeds backward, outward, and downward. The inferior oblique arises from the lower part of the orbit, and passes backward, outward, and upward. The action of the straight muscles is sufficiently obvious from their direction—when acting collectively they fix and retract the eye, and when acting singly they turn it toward their respective sides. The oblique muscles antagonize the recti, and draw the eye forward; the superior, acting above, directs the front of the eye downward and outward, and the inferior upward and inward. By the duly associated action of these muscles, the eye is enabled to move (within definite limits) in every direction.

The *eyelids* are two thin, movable folds placed in front of the eye to shield it from too strong light and to protect its anterior surface. They are composed of (1) skin; (2) of a thin plate of fibro-cartilage, termed the tarsal cartilage, the inner surface of which is grooved by thirty or forty parallel vertical lines, in which the Meibomian glands are imbedded; and (3) of a layer of mucous membrane, continuous, as we shall presently see, with that which lines the nostrils, and which joins the skin at the margin of the lids, in which the eyelashes (*cilia*) are arranged in two or more rows. The upper lid is much the larger, and to the posterior border of its cartilage a special muscle is attached, termed the *levator palpebræ superioris,* whose object is to elevate the lid and thus open the eye; while there is another muscle, the *orbicularis palpebrarum,* which surrounds the orbit and eyelids, and by its contraction closes the eye. The Meibomian glands secrete a sebaceous matter, which facilitates the free motion of the lids and prevents their adhesion. The eyelashes intercept the entrance of foreign particles directed against the eye, and assist in shading that organ from an excess of light.

The *lachrymal apparatus* consists of the lachrymal gland, by which the tears are secreted; two canals, into which the tears are received near the inner angle of the eye; the sac, into which these canals open; and the duct, through which the tears pass from the sac into the nose. The gland is an oblong body, about the size of a small almond, lying in a depression in the upper and outer part of the orbit. The fluid secreted by it reaches the surface of the eye by seven or eight ducts, which open on the conjunctiva at its upper and outer part. The constant motion of the upper eyelid induces a continuous gentle current of tears over the surface, which carry away any foreign particle that may have been deposited on it. The fluid then passes through two small openings (termed the *puncta lachrymalia*) into the canals; whence its further course into the lower portion of the nose is sufficiently obvious. The conjunctiva (or mucous coat), which covers the front of the eyeball and lines the inner surface of the lids, passes down and lines the canals, sac, and duct, and is thus seen to be continuous with the nasal mucous membrane, of which it may be regarded as an offshoot or digital prolongation. See MUCOUS MEMBRANES.

We shall conclude this sketch of the anatomy of the human eye with a brief notice of the *nerves* going to this organ and its appendages. Into each orbit there enters a nerve of *special sense*—viz. the optic nerve; a nerve of *ordinary sensation*—viz. the ophthalmic branch of the fifth nerve; and certain nerves of *motion* going to the muscular tissues and regulating the movements of the various parts—viz. the third, fourth, and sixth nerves. As the optic tracts from which the *optic nerves* originate are noticed in the article NERVOUS SYSTEM, we shall merely trace these nerves from their *chiasma*, or commissure, forward. This commissure results from the junction of the optic tracts of the two sides, and it is especially remarkable for the fact that it presents a partial decussation of the nervous fibres, the central fibres of each tract passing into the nerve of the *opposite* side, and crossing the corresponding fibres of the other tract; while the outermost fibres, which are much fewer in number than the central ones, pass to the optic nerve of the *same* side. In front of the commissure the nerves enter the optic foramen at the apex of the orbit, receive a sheath or investment from the *dura mater*, acquire increased firmness, and finally terminate in the retina. The peculiar mode of termination of the optic nerves in the cup-like expansion of the retina, the impairment or loss of vision which follows any morbid affection of them, and the constant relation in size which is observed in comparative anatomy between them and the organs of vision, afford sufficient evidence that they are the proper conductors of visual impressions to the sensorium.

The first or ophthalmic division of the fifth or trifacial nerve sends branches to the skin of the eyelids and to the conjunctiva. That it is the nerve of ordinary sensation of the eye is sufficiently obvious from the following facts: (1) That in disease of this nerve in the human subject, it is not uncommon to find the eyeball totally insensible to every kind of stimulus (particles of dust, pungent vapors, etc.); and (2) that if the nerve be divided in the cranium (in one of the lower animals), similar insensibility results.

The most important of the nerves of motion of the eye is the third nerve, or *motor oculi*. It supplies with motor power the elevator of the upper eyelid and all the muscles of the globe, except the superior oblique and the external rectus muscle, and, in addition to this, it sends filaments to the iris and other muscular fibres within the eye. The application of an irritant (in vivisection experiments) to its trunk induces convulsive contraction of the principal muscles of the ball and of the iris; while division of the trunk occasions an external squint, with palsy of the upper eyelid and fixed dilatation of the pupil. The squint is caused by the action of the external straight and the superior oblique muscles, while the other muscles are paralyzed by the operation. The normal motor action of the nerve upon the iris in causing contraction of the pupil is excited through the optic nerve, and affords a good illustration of *reflex action*, the stimulus of light falling upon the retina, and, through it, exciting that portion of the brain from which the third nerve takes its origin. This nerve clearly exerts a double influence in relation to vision: (1) It mainly controls the movements of the eyeball and the upper eyelid; and (2) from its connection with the muscular structures in the interior it regulates the amount of light that can enter the pupil, and probably takes part in the adjusting power of the eye to various distances.

The fourth nerve supplies the superior oblique muscle with motor power, while the sixth nerve similarly regulates the movements of the external straight muscle—the only two muscles in the orbit which are not supplied by the third pair.

Although not entitled to be termed a nerve of the orbit, the facial nerve deserves mention as sending a motor branch to the *orbicularis* muscle, by which the eye is closed.

PHYSIOLOGY. Having described the anatomical structure of the eye, we are able to proceed to the consideration of the uses of the various parts of this organ. Assuming a general knowledge of the ordinary laws of geometrical optics (see DIOPTRICS; LENS; etc.), we will trace the course of the rays of light, proceeding from any luminous body through the different media on which they impinge. If a luminous object—as, for example, a lighted candle—be placed at about the ordinary distance of distinct vision (about 10 inches) from the front of the eye, some rays fall on the sclerotic, and, being reflected, take no part in vision. The more central ones fall upon the cornea, and of these some also are reflected, giving to the surface of the eye its beautiful glistening appearance; while others pass through it, are converged by it, and enter the aqueous humor, which probably exerts no perceptible effect on their direction. Those which fall on and pass through the outer or circumferential part of the cornea are stopped by the iris, and are either reflected or absorbed by it; while those which fall upon its more central part pass through the pupil and are concerned in vision. In consequence of its refractive power, the rays passing through a comparatively large surface of the cornea are converged so as to pass through the relatively small pupil and impinge upon the lens, which, by the convexity of its surface and by its greater density toward the centre, very much increases the convergence of the rays passing through it. They then traverse the vitreous humor, whose principal use appears to be to afford support to the expanded retina, and are brought to a focus upon that tunic, forming there an exact but inverted image of the object.

This inversion of the image may be easily exhibited in the eye of a white rabbit or other albino animal, after removing the muscles, etc., from the back part of the globe. The flame of a candle held before the cornea may be seen inverted at the back of the eye, increasing in size as the candle is brought near, diminishing as it retires, and always moving in a direction opposite to that of the flame.

The adaptation of the eye to distinct vision at every distance beyond that of a few inches is extremely remarkable. The process to which the structures of the eye lend themselves in accomplishing this is known as *accommodation.* The essential factor in the process is the contraction of the ciliary muscle, which, as previously noted, allows the suspensory ligament of the lens to relax, with a resultant bulge of its anterior surface and a decrease in its focal length. According to Helmholtz, the radius of curvature of the anterior surface of the lens diminishes on turning the eye to a near object from ten to six millimeters (from about 0.4 to 0.24 of an inch), while the most projecting point of the same surface is brought forward about 0.2 of an inch. According to the observations of Hueck, the focal distance may be changed about three times in a second. The accommodation from a near to a distant object is effected much more rapidly than the converse process.

There are two well-known forms of defective vision in which this power of adaptation is very much limited—viz. short-sightedness, or *myopia,* and long-sightedness, or *hypermetropia.* The limitation, however, is not due to a defect in the muscular apparatus to which we have referred, but to an abnormality either in the curves of the refracting media or to congenital or acquired changes in the antero-posterior diameter of the ball. In *short-sightedness* from too great a refractive power from either cause, the rays from objects at the ordinary range of distinct vision are brought too soon to a focus, so as to cross one another, and begin to diverge before they fall on the retina, the eye in this case being able to bring to the proper focus on the retina only those rays which were previously diverging at a large angle from a very near object. The correction for this deficiency is accomplished by interposing between the eye and indistinctly seen objects a *concave* lens, with a curvature just sufficient to throw the images of external objects at the ordinary distance of distinct vision backward upon the retina. In *far-sightedness,* on the other hand, there is an abnormal diminution of the refractive power from too flat a cornea, a deficient aqueous humor, or a flattening of the lens, so that the focus is behind the retina. This defect is corrected by *convex* lenses, which increase the convergence of the rays of light. Presbyopia, as its name indicates, usually comes on at a comparatively advanced period of life, and is due to senile changes affecting the elasticity of the lens and its attachments.

We have already noticed the most essential use of the iris—viz. its power, under the influence of light upon the retina, of modifying the size of the pupil so as to regulate the amount of light entering the eye. But this is not its only use, one of its offices being to prevent the passage of rays through the circumferential part of the lens, and thus to obviate the indistinctness of vision which would arise from *spherical aberration* (the unequal refraction of the rays passing through the centre and near the margin of the lens), in the same manner as the diaphragms employed by the optician. But there are additionally two other means by which this spherical aberration is prevented, which so well illustrate the marvelous mechanism of the eye that we cannot omit to notice them. They are described by Wharton Jones as follows:

(1) "The surfaces of the dioptric parts of the eye are not spherical, but those of the cornea and posterior surface of the lens are hyperbolical, and that of the anterior surface of the lens elliptical—configurations found by theory fitted to prevent spherical aberration. This discovery was made at a time when it was not known but that the dioptric parts of the eye had spherical surfaces.

(2) "The density of the lens diminishing (as we have already shown) from the centre to its periphery, the circumferential rays are less refracted than they would have been by a homogeneous lens with similar surfaces. This elegantly simple contrivance has been hitherto inimitable by human art."

Chromatic aberration, which is caused by the unequal refrangibility of the primitive rays of which white light is composed, when transmitted through an ordinary lens, whereby colored fringes are produced, is *practically* corrected in the eye, although it is doubtful whether it is *entirely* absent. The provision, however, on which the achromatism depends has not been determined with certainty, probably because we do not yet know the relative refractive and dispersive powers of the cornea and humors of the eye. Sir David Brewster denies that the chromatic aberration receives any correction in the eye, and maintains that it is imperceptible only in consequence of its being extremely slight. See also VISION.

EYE, COMPARATIVE ANATOMY OF THE. How far down in the scale it is necessary to go to find animals which have no eyes depends upon whether we mean by 'eye' an organ capable of forming optical images, or simply an organ capable of responding to the stimulus of light. If the latter is really an eye, then we are justified in saying that all the large groups of animals higher than sponges have eyes, though many families and even some orders may lack them. Among cœlenterates, simple light-detecting organs, known as pigment spots, or 'pigment eyes,' and consisting of groups of pigment-cells associated with sensory cells, occur in many medusæ and in ctenophores. In some cases the cuticle over these spots is specially thickened to form a sort of a lens. Similar pigment eyes occur among the flatworms (Platoda), and in some cases they are somewhat more complicated by the additions of so-called retinal cells with rod-like processes. It is very doubtful, however, whether these eyes are really anything more than light-detecting organs. Pigment eyes very similar to these, though often somewhat more complicated, occur in many worms, crustaceans, insects, and mollusks, and in a few echinoderms. The eyes of tunicates and of Amphioxus are not of any higher degree of organization. In crustaceans the pigment eye is known as the 'unpaired' eye, and is apparently made up of three simple eyes fused together. In insects the pigment eyes are called 'ocelli,' and these also occur in spiders and scorpions. Pigment eyes are of service to their possessors in enabling them to distinguish between light and shade, and in detecting different degrees of light. Thus shadows cast by an approaching enemy would be noticed, and, in aquatic animals, approach to the surface would be quickly indicated.

Turning now to those organs which unquestionably form some sort of an image, we find there are two very distinct kinds—'simple' and 'compound' eyes. Simple eyes correspond in structure to a greater or less degree with the eye of man, while compound eyes are of a totally different kind. The latter are found only among arthropods, where they reach a high degree of development, the so-called compound eyes of some mollusks and sea-urchins being really much less complex. In arthropods the optic nerve bears two noticeable swellings—the optic ganglion, really a part of the brain, and the retinal ganglion, from which radiates the nerve fibres, entering the retinal cells. The retinal cells are grouped in clusters of four to seven, known as 'retinulæ,' which are more or less heavily pigmented distally. Each retinula is the basal part of a single eye, the upper portion of which consists of a crystal cone (wanting in the eyes of many insects), and of hypodermal elements covered with the chitinous cuticle developed as a cornea. These single eyes are crowded together, though separated from each other by pigment-cells, on a strongly convex basal membrane, thus forming a more or less convex compound eye. Rays of light falling on the eye are absorbed without giving rise to a visual stimulus, except such as are directly parallel to the long axis of the single eyes. Each of these eyes therefore forms an image of that which lies directly before it, and the whole compound eye thus forms a mosaic, probably with sharp outlines, but wholly lacking perspective.

Image-Forming Eyes. Such are first found in the animal kingdom in the group of Cubomedusæ, where, especially in the genus Charybdea, each individual possesses several quite complex eyes provided with lens, vitreous body, and retina. Many worms have very well-formed and often large eyes. It is among mollusks that we find the best-developed eyes among invertebrates. The eyes of dibranchiate cephalopods, as the squid, have a very complex structure, all of the parts essential to good sight in man's eye being present. There is, however, one very important difference between the cephalopod and the vertebrate eye, and that is that in the former the retinal-cell rods lie inside the limiting membrane, and are thus turned toward the light, while in vertebrates these visual rods are turned away from the light. In some mollusks, with much simpler eyes, the retinal-cell rods are turned away from the light, as in vertebrates.

Eye in Vertebrates. Passing now to the consideration of the vertebrate eye, we find that the structure is in all cases essentially similar to that of the human eye, though many cases of degenerate eyes are known, associated with some peculiarities of habit, as, in the hagfish, with a parasitic mode of life; or, as in the cave salamanders and fishes, with living in the dark. (See Cave Animals.) In fishes the eyes have little power of movement, the cornea is very flat, and the lens is globular; the eyes are thus accommodated, when at rest, for seeing *near* objects. The sclerotic is frequently calcified or ossified, and there is no ciliary muscle. In amphibians the eyes are somewhat simpler than in fishes, but the ciliary muscle is present as in all higher vertebrates. In both fishes and amphibians we find examples of angular pupils. In reptiles the eye shows slight advance in structure, in respect to some special peculiarities; thus, in lizards there is a ring of bony sclerotic plates and a curious structure, the 'pecten' (also present in snakes, crocodilians, and especially in birds), the function of which is in dispute, some saying it is concerned solely with the nutrition of the eye, others that it aids in accommodation. In birds the eyeball is not nearly spherical (as in other vertebrates), but is elongated so that it is much deeper than high. This is most marked in owls. In mammals the sclerotic is entirely fibrous, the external surface of the lens is less convex than the internal, and there is no pecten. The pupil may be round, transversely oval, or have the form of a vertical slit. In aquatic mammals the cornea is flattened as in fishes.

Bibliography. Lang, *Text-Book of Comparative Anatomy* (New York, 1896); Wiedersheim, *Comparative Anatomy of Vertebrates* (New York, 1886); Carrière, *Die Sehorgane der Thiere* (Munich and Leipzig, 1885).

EYE, Diseases of the. The diseases of the eye enumerated by the surgeon are very numerous, owing to the variety of the tissues and parts of which the eye is formed. Nearly all its parts are liable to inflammation and its consequences. (See Ophthalmia; Retinitis.) The eyelids are liable to various diseases, as growths of several kinds, most of which the surgeon may remove, and inflammation (see Blepharitis; Stye); they may be misdirected inward or outward, *entropion* and *ectropion* (qq.v.); and the upper eyelid may droop (*ptosis*) from paralysis of the motor oculi nerve, increased weight of the lid, or atrophy or loss of the eyeball. The eyelashes may grow in upon the eye (*trichiasis*, q.v.), and produce serious results. The duct which conveys the tears to the nose is liable to inflammation and obstruction. (See Lachrymal Organs.) The cornea is liable to opacity in various degrees. (See Cornea, Diseases of.) (For inflammation of the mucous membrane covering the eyeball and eyelids, see Conjunctivitis.) The pupil may be closed as the result of iritis (q.v.), or of operations for cataracts. (For opacities of the crystalline lens, see Cataract. For an account of inflammation of the optic nerve, see Optic Neuritis.) An important disease of the eye is glaucoma (q.v.). Various affections of vision may arise from peculiar or altered conditions of refraction, changes in the nerves, or in the action of the muscles moving the eyeball. (See Sight, Defects of.) The parts between the eye and its bony orbit may be the seat of inflammation, abscess, or tumor, making the eye protrude. The movements of the eyeballs may be affected from paralysis of the motor nerves, or from contraction or weakness of the muscles, causing squinting. (See Strabismus.) The eye may lose all feeling from paralysis of the fifth pair of nerves. The whole of the same side of the face, nostril, and mouth will be in the same condition, and the eye becomes inflamed and disorganized, because injuries to the eye by foreign bodies are not noticed. Substances thrown against the eye may injure it. If a caustic alkaline substance has got into the eye, weak vinegar or milk is the best thing to introduce until the physician arrives. If it is oil of vitriol (sulphuric acid) that has been the cause of the injury, a weak solution of soda may be used in the first place to neutralize the acid. In gunpowder explosions near the eye, besides the burn, the particles are driven into the surface of it, and will cause permanent bluish stains over the white of the eye, unless they are carefully removed at the time. When chips of glass, stone, etc., are driven into the interior of the eye, there is great danger of destructive inflammation and sympathetic ophthalmia. (See Ophthalmia.) Most commonly foreign bodies, as particles of dust, sand, seeds, flies, etc., merely get into the space between the eyeball and the lids, almost always concealed under the upper, as it is the larger, and sweeps the eye. They cause great pain, from the firmness and sensitiveness of the papillary surface of the lid, soon excite inflammation, and their presence as the cause is apt to be overlooked. The lid must be turned over to find them. To do this, pull the front or edge of the lid forward by the eyelashes, held with the finger and thumb, and at the same time press down the back part of the lid with the tip of the left forefinger, or with a small pencil or key. The lid will readily turn over, when the body may be seen and removed with the corner of a handkerchief. In other cases, a solution of cocaine must be instilled and a needle used to dislodge the particle. After the bodies are removed, a feeling as if they were still there may remain for some time. Consult May, *Manual of Diseases of the Eye* (New York, 1901).

EYE. A loop, ring, or hole through a substance; also direction, as *in the wind's eye.* The extreme forward part of a ship is called *the eyes of the ship.* Chinese junks and other native craft have blocks of wood shaped and painted to resemble human eyes placed on each side of the bow, and the hawse-holes of ships of Europe and America are sometimes compared to eyes, and may at one time have been so called. The *eyes* of the rigging are loops formed in the shrouds or stays for fitting around the mastheads. A *deadeye* is a block of hard wood (usually lignum vitæ) pierced with several holes. Two *deadeyes* are made to form a sort of tackle by reeving a rope through them; in rigged ships of old type the lower ends of shrouds and stays were secured to such tackles, which were kept in place permanently. An *eye-bolt* is a bolt that has a projecting end formed in the shape of a ring for the purpose of hooking a tackle or attaching a rope. *Eyelets*, or eylet-holes, are small circular holes in sails, awnings, etc., through which pass small ropes. An *eye-splice* is an eye formed at the end of a rope by separating the strands at the end and sticking them between the strands in a special manner at the proper place.

EYE, ī′e, August von (1825-96). A German art historian, born at Fürstenau, Hanover, May 24, 1825, and educated at Göttingen. He wrote valuable works on ancient and modern art and on philosophical subjects. He died at Nordhausen January 13, 1896. The best-known of his works is his *Leben und Werken Albrecht Dürers* (Nördlingen, 1860). He also edited a number of illustrated works treating the history of art and culture, among which were: *Gallerie der Meisterwerke altdeutscher Holzschneidekunst* (Nuremberg, 1858-61); *Deutschland vor 300 Jahren in Leben und Kunst* (Leipzig, 1857); *Kunst und Leben der Vorzeit* (Nuremberg, 1868). His principal philosophical work is *Das Reich des Schönen* (1878).

EYE OF GREECE. An ancient epithet of Athens.

EYEPIECE, or Ocular. The name given to the lens or lenses by means of which the image of the object formed at the focus of a telescope or microscope is observed. See Telescope, and Microscope.

There are two forms of eyepieces in general use, each of which possesses advantages for certain classes of work. In the Ramsden eyepiece there are two plano-convex lenses of equal focus placed with their curved sides toward each other. As the image is formed beyond the lenses this eyepiece can be used in micrometer miscroscopes. (See Micrometers.) In the Huyghenian eyepiece there are two plano-convex lenses, the lower of which has a focal length several times greater than that of the upper. The curved face of the upper lens faces toward the plane face of the lower, and the image is formed between the two. An account of the eyepieces used in microscopes will be found in Carpenter, *The Microscope* (8th ed., Philadelphia, 1901).

EYERMAN, ī′ẽr-man, John (1867—). An American geologist and genealogical writer. He was born at Easton, Pa., of Pennsylvanian Dutch ancestry, was educated at Lafayette College, and continued his studies at Harvard, Columbia, and Princeton universities. He was a lecturer on determinative mineralogy at Lafayette College, and in 1890 became associate editor of the *American Geologist.* His publications include: *The Mineralogy of Pennsylvania* (1891); *A Course in Determinative Mineralogy* (1892); *The Old Graveyards of Northampton* (1899-1901). For several years he has been engaged in compiling *The Bibliography of North American Vertebrate Palæontology.*

EYE-TEETH, also called Canine or Cuspidate Teeth. The two teeth in the upper jaw next to the molars, one on each side, the fangs of which extend far upward in the direction of the eye. See Teeth.

EYLAU, ī′lou, or **PREUSSISCH-EYLAU,** proi′sĭsh-ī′lou. A town of some 3000 inhabitants, situated on the Pasmar, about 24 miles south of Königsberg, Prussia. It is noted as the scene of a sanguinary battle between the French under Napoleon and a combined force of Russians and Prussians under Bennigsen and Lestocq, February 7-8, 1807. On the night of February 7th, the French army came in touch with the rear guard of the Russians at Eylau. After a murderous fight, during which the Russian position was thrice taken and lost, Soult succeeded in driving the enemy from the town. The following morning found the two armies drawn up at close range. Soult held the left wing of the French army; in the centre was the corps of Augereau; on the right flank was the division of Saint-Hilaire. Behind Augereau was Murat with his cavalry. On the extreme left and some ten miles in advance of the main battle-line was the corps of Ney engaged in hot pursuit of 8000 Prussians under Lestocq. On the extreme right and also in advance was the corps of Davout. It was Napoleon's intention to throw Davout's forces against the extreme left flank of the Russians, and by pressing it back upon the centre to send the entire hostile army flying in confusion toward Königsberg, where they would be intercepted by Ney. The plan miscarried, however, for Davout, delayed by a blinding snowstorm, did not deliver his attack before 1 o'clock in the afternoon. The battle began early in the morning with a furious cannonade, lasting several hours. Augereau's corps was then sent against the Russian centre, but was met with a terrific cannon fire, and was almost annihilated. For a time the centre of the French army was threatened, and to save the day, Murat's cavalry was hurled against the advancing forces of the Russians. They drove back the Russian cavalry, broke through the first two lines of infantry, but recoiled before the third, and could only regain their position by cutting their way through the lines of the enemy which had formed again behind them. Davout finally struck the enemy's left and succeeded in driving them from their position, and it seemed as if in spite of delay Napoleon's plan would be carried out after all. But at 3 o'clock in the afternoon, Lestocq, who had succeeded in escaping from Ney, arrived on the battlefield with 5500 men, and passing in the rear of the entire Russian army, assailed Davout with his fresh troops. Davout's forces were slowly pushed back from the most advanced of the positions they had captured, but both sides were soon too exhausted to do more than hold each other in check. Late at night, Ney arrived on the field, too late to bring victory to the French, but still in time to prevent a defeat which might have resulted from a concerted move on the part of the Russians. The numbers engaged were about 70,000 on either side. The losses were 18,000 for the Russians and Prussians, and somewhat more for the French. Against the advice of his lieutenants, Bennigsen retreated during the night, leaving the French masters of the field. Direct results the battle had none, and Eylau has passed into history as a huge, profitless carnage. Indirectly, however, it strengthened the enemies of Napoleon, by breaking the charm of his seeming invincibility.

EYMER'ICUS, Nicolas (1320-99). A Spanish theologian. He was born at Gerona, Catalonia, and entered the Dominican Order in 1334, rising to the rank of Grand Inquisitor, chaplain of Pope Gregory XI., and judge of heretics, in 1356. He lived successively in Aragon and Avignon, where he enjoyed the fullest confidence of Clement VI. and his successor, Benedict XIII. He was considered the greatest canonist of his time, and wrote the famous *Directorium Inquisitorum* (1503), which laid down the pernicious maxims subsequently followed by Torquemada.

EYNARD, ā′när′, Jean Gabriel (1775-1863). A French banker known for his interest in the cause of Greek independence. He was born at Lyons, and settled at Geneva in 1810, after accumulating a great fortune in mercantile pursuits at Genoa, Italy. He was the Ambassador of the Republic of Geneva to the Congress of Vienna, and in 1816 was appointed to assist in organizing the administration of Tuscany. He also served as the delegate of Tuscany at the Congress of Aix-la-Chapelle in 1818. In 1821 he became one of the foremost advocates of Greek independence, and for his services was naturalized as a Greek citizen. As he did not succeed in negotiating a loan for the Revolutionary Government in Paris and London, he personally contributed 700,000 francs. After conducting a sort of religious and political crusade throughout western Europe in behalf of the Greeks, he was largely instrumental in securing the throne of Greece for Otho of Bavaria. His fortune of about sixty million francs was bequeathed largely to charitable enterprises. His principal publications are *Lettres et documents officiels relatifs aux divers événements de Grèce* (1831), and *Vie de la baronne Krüdener* (1849).

EYRA, ā′rȧ (South American name). A remarkable cat (*Felis eyra*) of eastern South America, Central America, and Mexico. It is about the size of the domestic cat, but its legs are much shorter, and its body, neck, and head so slender and elongated as to present a striking similarity in form to a civet, increased by the extraordinary length and thickness of its tail. The pupil of the eye is round, the ears rounded, and the muzzle compressed. The fur is soft, of a uniform reddish yellow or chestnut color, with a whitish spot on each side of the upper lip and on the chin. It is most common in Brazil and Paraguay, but is known as far north as the borders of the United States. This is the cat to which the name represented by our word cougar (see Cougar) was first applied; and it is known in Mexico as 'apache.' It seems easily capable of domestication, since the few specimens kept in zoölogical gardens have quickly become gentle and playful, and sometimes have been at liberty about the buildings; and it is therefore sometimes adopted into the homes of the South Americans, but is likely to be mischievous to poultry. Eyras are expert hunters for all sorts of small mammals and birds. Consult: Azara, *Historia Natural de los Pajaros del Paraguay*, etc. (Madrid, 1805); Alston, "Mammals," in *Biologia Centrali-Americana* (London, 1879); Tegetmeier, "The Eyra Cat at the Zoölogical Gardens," in *The Field* (London, 1888). See Plate of Wild Cats.

EYRE, âr. A large salt lake in the northwest of South Australia, about 550 miles north of Adelaide, reached at Stuart Creek Station by the railroad from Adelaide to Oodnadatta. It consists of two extensive and shallow sheets of water, known as Lake Eyre, North and South, covering an area of about 4000 square miles, and connected by a narrow channel. There is no outlet; in the rainy season its principal feeders are the Diamantina, the Warburton, and the Truer or Macunda.

EYRE, âr (Scottish variants also *air*, *aire*, from AF. *eire*, OF. *erre*, *oire*, journey, from Lat. *iter*, road), or Eire, Justices in (corruption of Lat. *in itinere*). Itinerant, or, as we should say, circuit judges. By this term, both in England and Scotland, were the judges of assize (q.v.) formerly designated. Justices in eyre were first established in England by Henry II., in the sixteenth year of his reign (1170). The inconveniences and the frequent denials of justice resulting from the infrequency and irregularity of the royal progresses, at which justice was dispensed by the Curia Regis, throughout the kingdom, called for the institution of a different system. Accordingly, Henry appointed twelve justices to perambulate all the counties of England regularly, and to hear on the spot the complaints of his subjects. The number of these itinerant judges was in 1176 increased to 18, and at the Grand Council at Windsor in 1179, to 20. The subsequent rapid development of the regular common-law courts which resulted from the division of the Curia Regis and the institution of circuits regularly held by these, gradually threw the courts of the justices in eyre into the shade. They came to be regarded as of inferior position and authority, and in 1335 ceased to be appointed. Thereafter the expression had no precise meaning in England, but was sometimes loosely employed to describe the judges of the King's Bench, Common Pleas, and Exchequer, when on circuit.

In Scotland, the chief justiciar, says Erskine, i. 3, s. 25, was originally bound to hold yearly two justice courts or 'aires' at Edinburgh and Peebles. This court gradually became fixed at Edinburgh. Besides this court, special 'justice aires' were frequently held in the more remote parts of the country by the King in person, or by judges named by him, twice in the year—in spring and autumn (St. Robert III., c. 30, 1440 c. 5, 1491, c. 29). These courts were discontinued, but revived by Statute of 1587, c. 81. The term is still in use in Scotland, where, at the commencement of every circuit, proclamation is made to the lieges to attend the 'circuit aire.' See CIRCUIT; CURIA REGIS; COURT, and the authorities there referred to.

EYRE, âr, EDWARD JOHN (1815—). An English explorer and colonial governor. He was born in Yorkshire, England, but emigrated to Australia, where he soon became a magistrate, and in 1842 published *Discoveries in Central Australia.* For his achievements he was honored by the Royal Geographical Society, and received the appointment of Lieutenant-Governor of New Zealand in 1846, and of Saint Vincent in 1854. Two years later he was appointed Governor of Jamaica, where in 1865 he was obliged to use vigorous measures to suppress a negro insurrection. For the execution by court-martial of Gordon, who was thought to be one of the leaders, Eyre was censured and recalled on the ground that he had acted without sufficient evidence. On his return he was prosecuted for murder by a committee, of which John Stuart Mill was the most prominent member; but the charge was eventually dismissed. In 1874 he retired from public service.

EYRE, Sir JAMES (1734-99). An English judge, the son of Rev. Thomas Eyre, prebendary of Salisbury. He was born at Wells, Somersetshire, in 1734; became a scholar of Winchester in 1747, and a student of Saint John's College, Oxford, in 1749. At the age of nineteen, without waiting to take his degree, he went to London, and commenced the study of law, being called to the bar in 1755. A few years later he became Counsel to the Corporation of London, and in 1763 was made Recorder. In the same year he gained a great reputation through the skill and eloquence with which he conducted the famous suit of Wilkes vs. Wood, in which he successfully attacked the unconstitutional practice of the Government in issuing general search-warrants. (State Trials, xix., 1154.)

Eyre was knighted and made a Baron of Exchequer in 1772, became Chief Baron in 1787, and in 1793 was appointed Chief Justice of the Court of Common Pleas. In the latter capacity he presided at the famous State trials of Hardy, Horne Tooke, and others, for treasonable conspiracy, which resulted in the acquittal of the prisoners. For a short time, between the resignation of Lord Chancellor Thurlow, on June 15, 1792, and the accession of Lord Loughborough to the Chancellorship on January 21, 1793, Chief Justice Eyre held the highest judicial position in England, as Chief Commissioner of the Great Seal. As a lawyer and as judge, he displayed the highest legal and judicial qualities. Though not profoundly learned, he was well versed in the common law, and his patience, tact, and ingenuity, combined with an extraordinary power of sifting evidence and a luminous style, made him one of the ornaments of the English bench. He died July 1, 1799. See Howell's *State Trials,* xix., 1154-55; xxiv., 199; xxv., 2, 748 (London, 1809-26); Foss, *Lives of the Judges of England* (1848-64).

EYRE, JANE. See JANE EYRE.

EYRE, Sir ROBERT (1666-1735). An English judge, son of Sir Samuel Eyre of Newhouse, Wiltshire, who was himself a judge of the King's Bench. Robert was born in 1666, entered Lincoln's Inn in 1683, and was admitted to the bar in 1689. Seven years later he became Recorder of Salisbury, and from 1698 to 1710 represented that borough in Parliament. In 1707 he became Queen's counsel and the next year was appointed Solicitor-General. In that capacity it fell to his lot to conduct the celebrated Sacheverell case. He was made a justice of the Queen's Bench in 1710, and had knighthood conferred upon him. He became Chief Baron of the Court of Exchequer in 1723, and Chief Justice of the Common Pleas in 1725. Having been accused of official misconduct in connection with a case of malfeasance tried before him, his conduct was investigated by a committee of the House of Commons, which completely exonerated him. He was the intimate friend and associate of the great men of his time, and wielded considerable influence at Court, but he never attained to the first rank among English judges. He died in 1735. Consult: Howell's *State Trials,* xv., xvii. (London, 1809-26); Burnet, *History of His Own Time* (London, 1723-34); Foss, *Lives of the Judges of England* (London, 1848-64).

EYTELWEIN, ī'tel-vīn, JOHANN ALBERT (1764-1848). A German engineer, born in Frankfort-on-the-Main. He was appointed director of the architectural school in Berlin, upon the opening of that institution in 1799. He conducted the hydraulic operations for the improvement of navigation on the Warthe, Weichsel, Oder, and Niemen; built the harbor-extensions of Memel, Pillau, and Swinemünde; determined the boundaries of the Rhine Province; and established a system of weights and measures for Prussia. His principal works are the following: *Praktische Anweisung zur Bauart der Faschinenwerke an Flüssen und Strömen* (2d ed., 1818); *Vergleichung der in den preussischen Staaten eingeführten Masse und Gewichte* (2d ed., 1810); *Handbuch der Statistik fester Körper* (2d ed., 1832); *Handbuch der Hydrostatik* (1826).

EYTH, īt, MAX (1836—). A German engineer and author, born at Kirchheim-unter-Teck. In 1861 he became engineer in Fowler's manufactory of agricultural implements at Leeds, for which he traveled extensively abroad. He was chief engineer of Halim Pasha from 1863 to 1866, during which years the steam plow was introduced into Egypt. He was one of the founders of the German Agricultural Society. His principal works include: *Das Agrikulturwesen in Aegypten* (1867); *Steam Cable Towing* (1868); *Das Wasser im alten und neuen Aegypten* (1891); *Wanderbuch eines Ingenieurs: In Briefen* (1871-84), an interesting illustrated description of his travels; *Volkmar* (3d ed., 1876), a historical poem; *Mönch und Landsknecht* (2d ed., 1886).

EYTINGE, ī'tĭng, Rose (1838—). An American actress and author, born in Philadelphia. From 1862 to 1869 she played in various theatres in New York City, and then went abroad with her second husband, Col. George H. Butler, Consul-General to Egypt. On her return thence in 1871 she took the rôle of Cleopatra at the Broadway Theatre, to the Antony of Frederick Warde. Among her principal later parts were Nancy Sykes in *Oliver Twist*, Gervaise in *Drink*, Ophelia to the Hamlet of E. L. Davenport, and Desdemona with James W. Wallack as Othello and Davenport as Iago. Her literary works include adaptations of Dickens's *Oliver Twist* and *Dombey and Son*, and Browning's *Colombe's Birthday*, and her own personal *Recollections*, published serially. Consult Clapp and Edgett, *Players of the Present* (Dunlap Society, New York, 1899).

EYUK, ā-yo͞ok', or **UYUK**, o͞o-yo͞ok'. A village in Asia Minor, built upon the small plateau of a hill, 75 miles west-southwest of Amasia. It has only about thirty houses, but is important as containing some of the most remarkable ruins in the East. They are the remains of a palace of enormous extent, and consist of colossal walls and blocks of granite containing a great variety of sculptures, chiefly gods, processions, and religious rites, many of which are in an admirable state of preservation. The building is one of the most significant monuments left by the Hittites, whose art and architecture as illustrated in the case of the palace at Eyuk are chiefly derived from Assyria, though betraying Egyptian influences. (See Hittites.) Consult Perrot and Chipiez, *History of Art in Sardinia, Judæa, Syria, and Asia Minor*, Eng. trans. (New York, 1890).

EYZAGUIRRE, ā'ê-thȧ-gē'rȧ, Agustin (1766-1837). A Chilean statesman. He was one of the principal leaders in the movement for national independence in 1810, and in 1813 was a member of the first National Junta. He was taken prisoner by the Spaniards at the battle of Rancagua in October, 1814, and was imprisoned on the island of Juan Fernandez for three years. He was subsequently engaged in an enterprise for the establishment of trade between Chile and India. On the downfall of the O'Higgins Administration in 1823 he was elected President of the Provisional Junta, and soon afterwards was elected to the office of Vice-President. On the resignation of President Freire (September 10, 1826), he became Acting President, and retained this position until January, 1827, when he was deposed by a military mutiny.

EZE'KIEL (Heb., *Yeḥezqēl*, God makes strong). One of the four 'greater' prophets. He was the son of the priest Buzi, a member of the Zadokite clan, which toward the close of the seventh century B.C. began to obtain complete control of the Yahweh cult in Jerusalem. He probably spent his youth in the temple at Jerusalem until the year B.C. 597, when, with Jehoiachin, King of Judah, and a large number of the people, he was carried captive to Babylonia by order of Nebuchadnezzar. There the Jews formed a separate community under the government of elders and engaged in agriculture. They probably paid a tax to the Government, but in other ways were left unmolested. Ezekiel settled at Tel-Abib on the banks of the river Chebar, and probably appeared as a prophet about the year B.C. 592, when he was apparently about 32 years of age. His prophetic career extended over a period of about twenty years. The date of his death is not recorded.

Ezekiel's life was short, as is evidenced by his book; but he spent his days in comforting and encouraging his people, while endeavoring to open their eyes to the real significance of current events, and particularly of the national catastrophe with the resultant captivity of the people. Respected by the people, his influence was profound, though his task was a difficult one in rousing the masses, who were indifferent to the religious aspects of the situation. Ezekiel was essentially a priest. His interest is largely in matters connected with the ritual, but he also possesses the traits of a prophet. His imagination is impetuous, and features of his discourses are the visions, parables, and allegories with which they are filled. His style, while vigorous, lacks simplicity, and, on the whole, his moral tone, while strong, is also severe. He is a particularly interesting figure as representing the transition from the prophetic to the priestly period. His elaborate programme for the cult foreshadows the post-exilic history of Judaism which centres around the observance of the minutiæ of religious ceremonialism. See Ezekiel, Book of.

EZEKIEL, Book of. The third of the so-called greater prophets. While the prophecies of Ezekiel have come down to us, as concerns the subject-matter, substantially in the form in which the prophet himself left them (though doubts have recently been cast on this point), the Hebrew text is full of errors, containing additions by scribes, and changes which indicate that a revision was made subsequent to the prophet's death, or possibly several changes. By means of the Septuagint translation, which is based on a text varying considerably from the Hebrew, many of the original readings can be restored, and the Hebrew text otherwise improved. The book, consisting of forty-eight chapters, may be divided into four sections, the contents of which may be summarized as follows:

Part i. (chs. i.-xxiv.) consists of an introduction reciting the vision of Jehovah seated on a celestial chariot-throne supported and set in motion by four creatures, each having four wings and four faces, viz. man, lion, ox, eagle. (See Cherub.) From the mouth of Jehovah, Ezekiel receives his call to the prophetic office, his commission to act as a guide to Israel. There follow prophecies against the people of Israel (chs. iv.-xxiv.), subdivided into eighteen sections. (1) The siege of Jerusalem, represented by a picture drawn on a tablet; the prolonged transgressions of the people; and the hardships they should suffer, by the eating of a coarse and loathsome bread. (2) Judgments on the city by famine, war, and dispersion abroad, signified by hair and beard cut off, weighed, scattered, and burned. (3) Judgments against idolatry, with a promise that a remnant should be saved. (4) Captivity, inevitable and severe, under the emblem of a chain. (5) Transgressions of Judah, represented by the image of jealousy, and consequent judgments, typified by the scattering of fire, and the departure of the shekinah. (6) The captivity of Zedekiah, represented by the removal of household goods, and bread eaten with trembling. (7) False prophets reproved and threatened. (8) Idolatrous elders condemned. (9) The rejection of Jerusalem, represented by the burning of an unfruitful vine. (10) God's compassionate love, against which Israel had sinned, compared to kind care shown to a child cast out at its birth. (11) Judgments on Israel for turning to Egypt for help against Babylon denounced under the emblem of two great eagles, one representing Nebuchadnezzar, and the other Pharaoh. (12) Judgment denounced on every transgressor for his own sins, contrary to the common proverb implying that children suffer for their fathers' faults. (13) Captivity of the Jewish kings, represented by lions pursued and captured, and of the Jewish people, by a vine scorched, torn up, and planted in the wilderness. (14) God's mercies to Israel, and their continued transgression reviewed; and, while final forgiveness is promised to the penitent, impending judgments are declared. (15) A consumed forest represents Jerusalem destroyed, and a sharp sword, Nebuchadnezzar cutting down Ammonites and Jews. (16) Recital of sins committed in Jerusalem by all classes of the people, and judgments on them denounced. (17) Idolatries of Samaria and Jerusalem, and their punishment. (18) Dreadful destruction of Jerusalem again proclaimed.

Part ii. consists of prophecies against various nations around Judea (chs. xxv.-xxxii.), subdivided into three sections. (1) Against the Ammonites, Moabites, Edomites, and Philistines. (2) Against Tyre (represented, in its beauty, wealth, and renown, as the anointed cherub on the mountain of God), with a promise of returning prosperity to Israel. (3) Against Egypt. In the last two prophecies Nebuchadnezzar is named as the instrument appointed to carry out God's purposes.

Part iii. embodies the promises of future deliverance to Israel (chs. xxxiii.-xxxix), subdivided into five sections. (1) The prophet is compared to a watchman appointed to give warning of danger, and is exhorted to be faithful. While under the power of the prophetic spirit, being informed that Jerusalem had been taken by Nebuchadnezzar, he foretells the desolation of the land, and reproves the hypocrisy of the captives around him. (2) The rulers, civil and ecclesiastical, condemned as unfaithful shepherds, and a general restoration of the people promised under the guidance of the good shepherd, David the prince. (3) Judgments against Edom again foretold. (4) Promises of restoration renewed to Israel, under the emblems of fruitful mountains, sprinkled water, a new heart, dry bones raised to life, and two sticks united together. (5) Destruction of Gog (i.e. the Scythian forces advancing from the north), followed by blessings to Israel.

The fourth series of discourses (chs. xl.-xlviii.), while forming part of the general picture of the restoration, is separated by its character from the rest of the book, and reveals the priestly interests of Ezekiel. It gives (1) an elaborate picture of the future temple based apparently on the temple of Solomon; (2) a description of the altar and offerings; (3) the functions of the priest; (4) the territorial distribution of the tribes and boundaries of the land.

There are two features of Ezekiel's prophecies that are of special significance: (1) the visions, and (2) the descriptions of the temple cult. The former marks the beginning of that tendency in Jewish thought that led to the production of the extensive apocalyptic literature (q.v.), chiefly between the second century B.C. and the second century A.D. (See CHERUB; APOCRYPHA.) The latter stands midway between the Deuteronomic code and the final priestly legislation, for which it paves the way. Ezekiel's programme and general notions of the functions and privileges of the priest were followed largely in the so-called Holiness Code (Lev. xvii.-xxvi.), though the latter represents an even more advanced ritualistic standpoint. A notable difference, however, between Deuteronomy and Ezekiel is that, whereas according to the former all Levites are priests, according to Ezekiel only the Zadokites are recognized, while in the still later Holiness Code only descendants of Aaron are regarded as priests. Again, as regards festive seasons, Deuteronomy mentions three great festivals—Passover, Weeks, and Booths—whereas Ezekiel omits the second, but adds a special ceremony of purification for the first days of the first and seventh months, and the Holiness Code has in addition to the three given in Deuteronomy, the Feast of Trumpets (the post-exilic New Year's Day) and the Day of Atonement.

The direction thus given by Ezekiel to the elaboration of the cult was followed in succeeding generations. It is his spirit which pervades the perfected Priestly Code, and in a significant sense it is Ezekiel who may be denominated the forerunner of post-exilic Judaism, which centres around the temporary cult and ceremonial minutiæ. This constitutes his main claim to an immortal position in Hebrew history. In moral sublimity and in eloquence he is surpassed by Isaiah and others, in profundity of feeling and unalloyed patriotism by Jeremiah; but it is Ezekiel who, drawing from the past with its tribulations and final catastrophe the lesson that the future restoration and the future happiness of the people depend upon their observance of Jehovah's decrees, regards it as the most important task of the leaders to determine in the most minute way exactly what Jehovah has commanded, exactly how He is to be worshiped, and then to spare no efforts in the endeavor to have these regulations carried out. Salvation rests upon the temple cult, the constitution of a legitimatized priesthood, and upon the strict obedience of the people in observing the Sabbath and festivals, in paying tithes, bringing sacrifices, and observing all such laws as are placed before them by the authority given to their religious leaders—the priests. Consult the commentaries, particularly Smend, Keil, Davidson, Bertholet, Toy, and Krätschmar; also Cornill, *Der Prophet Ezechiel geschildert* (Heidelberg, 1882), and *Das Buch des Propheten Ezechiel* (Leipzig, 1886); D. H. Müller, *Ezechiel-Studien* (Vienna, 1894).

EZEKIEL, MOSES JACOB (1844—). An American sculptor, born in Richmond, Va. He was educated in his native city, and fought in the Civil War. In 1869 he entered the Academy of Art in Berlin, where he studied under Wolf, and in 1873 received the Michael Beer Prize for sculpture, the first American to obtain that distinction. He then went to Rome and set up his studio in the ruins of the Baths of Diocletian.

His first large work was a group representing "Religious Liberty," which he was commissioned to model for the Jewish Order of the Sons of the Covenant (1874). It is now in Fairmount Park, Philadelphia. Among other works by him are the much-discussed "Christus," "Eve Hearing the Voice," "The Daughter of Eve," "Judith," a Madonna for a church in Tivoli, eleven statues of famous artists for the Corcoran Gallery in Washington, and the Jefferson Monument in Louisville, Ky. His portraits, in the round and relief, include those of Liszt, Hohenlohe, Longfellow, Lee, and Farragut. The work of Ezekiel is little known in this country, for the best of it remains abroad. It departs from the conventional standard in many cases, and is original and strong in sentiment. It also shows the influence of Michelangelo rather than the Greek models, although such works as "Consolation," "Pan and Cupid," and "Apollo and Mercury" are classical in tendency.

EZION-GEBER, ē′zĭ-ŏn gē′bẽr (Heb., where Geber-trees grow). A station of the Israelites on their road from Egypt (Num. xxxiii. 35; Deut. ii. 8). It was originally a city of Edom, which David conquered (II. Sam. viii. 14). Later it was the station of Solomon's navy, which was engaged in the gold trade with Ophir (I. Kings ix. 26; II. Chron. viii. 17); when Jehoshaphat fitted out ships for a similar purpose they were broken at this port (I. Kings xxii. 48; II. Chron. xx. 36-37). Josephus (Ant. viii. 6, 4) says the place was called Berenice in his day. Ezion-Geber is probably identical with the modern Ain-el-Ghudyan, where is now the dry bed of the Arabah near Elath (q.v.).

EZ′RA (perhaps shortened from *Azariah*, Jehovah helps). With Nehemiah the most prominent figure connected with the return of the Hebrews from Babylonia and the reorganization of the temple cult. Of the details of his private life but little is known. He belonged to a priestly family, and was resident in Babylon in the reign of Artaxerxes Longimanus (B.C. 465-425). With this monarch he seems to have been in considerable favor, and in the year B.C. 458 obtained permission to return to Jerusalem with a band of his countrymen, 1754 in number. Ezra was authorized to carry offerings to the temple made by the King and by the Jews who remained behind, to purchase sacrificial animals, and to use the rest of the money that was given to him as he saw fit. As further privileges, all those engaged in the service of the temple were freed from taxation. A later generation exaggerated the authority given to Ezra, and assumed that he was also instructed and given power to carry out the laws of the Persian King and the law of God. While Ezra did not enjoy any authority of this kind, he, aided by the statesman Nehemiah, became an influential member of the new colony.

Ezra, on his arrival in Palestine, found the Jewish population, priests and Levites included, contracting marriages with non-Jewesses. To one profoundly impressed with the fundamental principle that Jehovah's people are to remain pure if the laws of Jehovah are to be carried out, such a state of affairs was distressing, and we can well understand Ezra's grief bordering on despair. The question was taken up in an assembly of the people held in the year of Ezra's arrival; but beyond the appointment of a commission of inquiry, which drew up a list of persons who had entered upon mixed marriages, little was done. More radical measures were needed; but the cause languished until the advent of Nehemiah, when the attempt was made to enforce the law, not only against the mixed marriages, but also the various other regulations in the legal codes, such as the observance of the Sabbath day, the letting the land lie fallow every seventh year, the contributions to the temple treasury, and the payment of tithes. A number of persons had agreed to abide by the law; they formed the nucleus of the true Israel, and through them the opportunity was presented to lay before the whole people on a solemn occasion the full law promulgated in the name of Moses, and which contained the minute regulations of the cult. Most scholars are of the opinion that this event took place in the year B.C. 444, and is the one described in Nehemiah, chs. viii.-x., where Ezra with Nehemiah at his side is pictured as gathering the people on the plateau before the Water Gate, and reading to them the Book of the Law. The impressive scene is described in detail. Two days are consumed in the reading. The people are profoundly impressed, and portrayed as moved to tears at the thought of their past disobedience. Preparations are at once made to carry out the law, and as a symbol of repentance a great fast is held. There is no reason to question the theory that Ezra used his time in Jerusalem in preparing an elaborate code, and that this code was promulgated on the occasion of Nehemiah's first visit to Jerusalem, and not, as some scholars are inclined to believe, on the second visit (B.C. 433). Still there are features connected with the promulgation that are very obscure, as indeed is the whole question of the relationship of Ezra to Nehemiah. The new law book thus brought to the people is the compilation to which scholars have assigned the name Priestly Code (P) or Law-book, and which forms an important part of the present Pentateuch or Hexateuch (q.v.). Like the Yahwistic and Elohistic histories (see Elohist and Yahwist), the Priestly Code was a mixture of narrative and legislation, with this distinction—that in the latter the legislative parts predominate and that the past of Israel is not merely viewed from the theocratic position, but with constant regard to the ceremonial law. The creation narrative is given in P for the sake of the Sabbath command attached to it, not, as in J, as a sole illustration of Jehovah's eternity and supreme power; and similarly the Flood interests P because of the prohibition against eating blood which is connected with it. He reviews the lives of Patriarchs, furnishes genealogies, and manifests fondness for statistical details. The aim and goal of the narratives is, however, the Law, to which the narratives serve simply as an introduction and a framework. This law covers the greater portions of Leviticus and large parts of Numbers. The priestly writer carries his narrative down through the death of Moses into the period of the conquest of Canaan. Whether Ezra's book was the Priestly Code in its complete shape or not, we may feel certain that what he read to the people was substantially what scholars designate as such. The movement thus inaugurated met with success. The new law book was formally recognized and the temple service was regulated according to its theories and prescriptions. Naturally, not all the laws were carried out, or could be, and it is doubtful whether, at any time in the history of Israel, all the Pentateuchal regulations were adhered to in their detail; but what is important to note is that with Ezra the definite departure begins leading to a conception of Judaism as essentially identical with the observance of canonical minutiæ, that may best be designated as Rabbinical or Talmudic Judaism.

Ezra, besides being called the priest, is explicitly designated as the scribe. He receives the title by virtue of his activity in bringing the new law book before the people. As a scribe, he is the forerunner of the rabbis who in the succeeding centuries usurp the place of the priests, and as the students and interpreters of the law become the characteristic feature of Judaism, until in the nineteenth century the reaction against Talmudic Judaism set in.

For the various views held regarding the reorganization of the Jews after the exile, consult: Kosters, German translation, *Die Wiederherstellung Israels* (Heidelberg, 1895); Meyer, *Entstehung des Judenthums* (Halle, 1896); with Wellhausen's criticisms in the *Göttinger Gelehrte Anzeigen*, February, 1897, and Meyer's answer, *Julius Willhausen und meine Schrift, Die Entstehung des Judenthums* (Halle, 1897); Marquardt, *Fundamente der jüdischen Geschichte* (1896); Cheyne, *Jewish Religious Life After the Exile* (New York, 1898). See EZRA, BOOK OF.

EZRA, BOOK OF. A record of portions of Jewish history after the Babylonian exile. It originally formed in the Jewish canon one book with Nehemiah, and is supposed to have been compiled by the author of Chronicles from various documents, such as: (a) the memoirs of Ezra and Nehemiah; (b) accounts of the building of the temple at Jerusalem in the reign of Darius; (c) lists of heads of priestly and Levitical families; (d) lists of returned exiles—to all of which sources the redactor has made additions of his own. In the Septuagint the two books are still one and are called Esdras B (see ESDRAS, BOOKS OF).

A division into two parts suggests itself, the first of which (chs. i.-vi.) contains: (1) The decree of Cyrus, dated in the first year of his reign and giving permission to the Jews to return to their own land and rebuild their temple. (2) The record of his restoration of the sacred vessels of silver and gold which Nebuchadnezzar had taken from the temple and brought to Babylon. (3) The return of a portion of the people and the commencement of the work. (4) The obstacles placed in their way, chiefly by the Samaritans, in consequence of the refusal of the Jews to allow them to share in the work. (5) The interruption of the work till the second year of Darius Hystaspes, who, having found the decree of Cyrus, confirmed it and gave the Jews additional privileges and help by which they were enabled to complete their temple in the sixth year of Darius and reëstablish divine worship. This part thus comprises the history of the Jews from B.C. 538 to 515. The second part (chs. vii.-x.) takes us to the seventh year of Artaxerxes I. Longimanus (B.C. 458), and contains: (1) The decree of Artaxerxes, giving Ezra authority to proceed to Jerusalem with all Jews who wished to accompany him, and reëstablish the Jewish State. On this occasion, the King, with his counselors, added large sums of silver and gold to the free-will offerings of the people, and also directed his treasurers in the provinces intervening between Babylon and Jerusalem to furnish the expedition liberally with needed supplies. (2) The arrival of Ezra, accompanied by 600 chief men and 200 priests and Levites. (3) The measures taken by Ezra for the suppression of mixed marriages.

The historical value of the narrative in Ezra and Nehemiah varies with almost every chapter. It is now considered doubtful whether the memoirs of Ezra and Nehemiah (Ezra vii. 27 to viii. 34, and ix.; Neh. i. 1 to vii. 5, and xiii. 4-31), in which the two are introduced as speaking in the first person, are authentic; and it seems, in any case, certain that the memoirs do not lie before us in their original form. The decree of Artaxerxes, more particularly, cannot be regarded as authentic. Strong arguments have also been brought forward against the current theory that any formal return of exiles in large numbers took place in the days of Cyrus. The lists in Ezra and Nehemiah are, on this theory, transferred to the days of Ezra, with whom the movement for a reorganization of the Jewish theocracy thus begins. This theory also carries with it the unhistorical character of the narrative regarding the restoration of the walls of Jerusalem long before Nehemiah's times (Ezra iv. 6-23). In short, the compiler of Ezra and Nehemiah approached his theme with a certain theory, and did not hesitate to rearrange his material and make his changes and additions in the documents from which he worked, so as to present the history of the Jews from the days of Cyrus as one continued endeavor on the part of the returned exiles to build this temple and establish the cult in accordance with the supposed laws given by Moses; whereas in reality it was the Jews who had remained in Judea and Jerusalem by whom the work of rebuilding the temple was begun, the exiles playing no part till B.C. 445, on the occasion of Nehemiah's first visit to Jerusalem. The late W. K. Kosters of Leyden, who first propounded this theory, also claimed that Ezra did not come to Jerusalem till Nehemiah's second visit in B.C. 433, and that it was on this occasion that the new law-book was brought to the people at the assembly which marks the constitution of the congregation of Israel. Certain features of this theory, such as the late date of Ezra's arrival, have been generally rejected; but the doubts cast upon the authenticity of the events, at least in the order as related by the compiler of Ezra and Nehemiah, appear to be justified, though further investigation is required to dispose of some of the problems that still beset the scholar for the period B.C. 538-430, which is one of the most puzzling in Jewish history.

Consult, besides the works referred to under EZRA, Torrey's important monograph on The *Composition and Historic Value of Ezra and Nehemiah* (Giessen, 1896), and the commentaries on Ezra and Nehemiah by Ryle, Keil, Oettli, and Siegfried, though in view of the direction recently taken by Old Testament studies on Ezra-Nehemiah, these are in part antiquated. See EZRA; NEHEMIAH.

EZZELINO, ĕt'se-lē'nō, DA ROMANO. An Italian Ghibelline family. The first Ezzelino was a

German cavalier who settled in Italy at the time of the Hohenstaufen dynasty, and was given the Castle of Romano; hence the name. Ezzelino II. was, against all the family traditions, a Guelph. He lived about 1180. His son, Ezzelino III., was podestà of Vicenza until a Guelph success (1194) caused his downfall. With the protection of the Emperor, Otto IV., he regained his position, but finally abdicated (1215). Ezzelino IV. (1194-1259), his son, was the most celebrated of the family. Upon the abdication of his father he became podestà of Vicenza, and directed all his energies against the enemies of his house. He established his capital at Padua, and by the victory of the Emperor Frederick II. at Cortenuova (1237) became master of northern Italy from Milan to the Adriatic. His cruelty and impiety caused him to be excommunicated in 1252, and the Lombard cities made a league against him which he could not resist. He was taken prisoner in 1259, and died soon after. His brother and all his family were murdered.

F

F The sixth letter and fourth consonant in the Græco-Roman alphabet. The Phœnicians called the letter *vau* (or *wau*). This has usually been supposed to mean a nail or peg. As the Hebrew is the only Semitic tongue in which *vau* occurs as a word, it is probable that the name of this letter was not originally a word, but merely the sound of *u* or *w*. Its form is derived from the ϝ (a semi-vowel) found in the earliest Greek inscriptions, called *digamma*, from a fancied resemblance to a pair of gammas. See ALPHABET; LETTERS.

PHONETIC CHARACTER. F is pronounced by joining the lower lip and the upper teeth, and it is a labio-dental voiceless aspirate. Its corresponding voiced labio-dental is *v*. Latin *f* was practically the same sound as English *f*, and was not like the Greek *φ*, which was distinctly a double sound (p + h), pronounced as in *top-heavy*. Under certain circumstances *f* may take the place of any of the mutes. Original *bh*, *gh*, and *dh* (in English *b*, *g*, *d*) may be represented by Latin *f*, as Skt. *bharati* 'he bears,' Lat. *fert*, Eng. *bears*, Skt. *gharmas*, Lat. *formus*, Eng. *warm*. English *f* represents (1) an original *p*: Skt. *pitar*, Eng. *father*; Skt. *pāda*, Eng. *foot*; (2) a guttural: Lat. *quatuor*, Eng. *four*; Lat. *quinque*, Eng. *five*. The pronunciation of gutturals has a tendency to lapse into the easier sound; cf. *cough*, *laugh*, pronounced as if spelt with an *f*. Anglo-Saxon *f* sometimes disappears in modern English, e.g. *wīf-man*, and *hlāford*, now *woman* and *lord*.

AS A SYMBOL. F, in music, is the fourth note of the natural diatonic scale of C, and stands in the treble clef in the first space or in the fifth line; in the bass clef it stands on the fourth line or in the first space below. In chemistry F = fluorine. F as an abbreviation stands for 40; with a bar above F it is 40,000.

FA'BELL, PETER. A personage born and buried at Edmonton, Middlesex, England, mentioned as having died during the reign of Henry VII. (1485-1509). He was said to have sold his soul to the devil, and after him is named the chief character in the once popular play *The Merry Devil of Edmonton*.

FABER, fä'bẽr, CECILIA BÖHL VON. See CABALLERO, FERNAN.

FA'BER, FREDERICK WILLIAM (1814-63). An English prelate. He was born at Calverley, England; studied at Balliol College, Oxford, where he became an enthusiastic admirer of John Henry Newman, and was ordained priest in 1839. After some years spent in traveling on the Continent he became a convert to the Roman Catholic Church, and founded a religious community at Birmingham. This community was ultimately merged in the Oratory of Saint Philip Neri, of which Newman was the head, and in 1849 a branch was established in London, over which Faber presided till his death. He published a number of theological works, but it is mainly as a writer of fervent and graceful hymns that he will be remembered. He wrote "O Gift of Gifts, O Grace of Faith," "Paradise, O Paradise," and other familiar hymns.

FABER, fä'bẽr, FREDERIK (1795-1828). A Danish zoölogist. He was born at Odense, on the island of Fünen, and graduated in law in 1818. From early youth he displayed a great interest in zoölogy, and published his first book on that subject in 1815, under the title, *Indledning til Drylæren til Brug ved den Naturhistoriske Undervisning*. From 1819 to 1821 he traveled through Iceland, and he published his investigations in a work of permanent value, entitled *Ueber das Leben der hochnordischen Vögel* (1825-26). His other works include *Prodromus isländischer Ornithologie* (1822), with the supplement entitled *Nachtrag zur isländischen Ornithologie* (1824); *Naturgeschichte der Fische Islands* (1829); and numerous contributions to Oken's *Isis* and the periodical entitled *Tidsskrif for Naturvidenskaberne*. His name has been applied to several zoölogical species.

FA'BER, GEORGE STANLEY (1773-1854). A learned divine of the Anglican Church. He was the eldest son of the Rev. Thomas Faber, and was born at Calverley, Yorkshire, October 25, 1773. He entered University College, Oxford, in 1789. In 1796 he took his degree of M.A.; was Bampton Lecturer for 1801, and in 1805 became Vicar of Stockton-on-Tees, Durham. After several changes, he received from Bishop Van Mildert, in 1832, the mastership of Sherburn Hospital, near the city of Durham, where he died, January 27, 1854. His management of the hospital estates was very judicious and successful. Faber wrote upward of forty works, several of which enjoyed an extensive popularity, but have little permanent value. The principal are: *The Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations* (1823); *The Difficulties of Infidelity* (1824); *The Difficulties of Romanism* (1826, 3d ed. 1853); *The*

Sacred Calendar of Prophecy (1828); *The Primitive Doctrine of Election* (1830); *The Primitive Doctrine of Justification* (1837); and *Eight Dissertations upon the Prophetical Promises of a Mighty Deliverer* (1845). In several of his works he ventured to prophesy the downfall of the Turks and the rise of Napoleonism, and to discourse upon the origin of idolatry. Consult the memoir by F. A. Faber in G. S. Faber's posthumous *Many Mansions in the House of the Father* (1854).

FABER, fȧ'bâr', or Fabri, Jacques Lefèvre d'Estaples, Lat. Jacobus Stapulensis (c. 1450-c.1536). A French Roman Catholic, one of the first scholars and exegetes of his time. He was born at Estaples (Etaples), near Boulogne, about 1450. He studied at the University of Paris, and became professor in the College of Cardinal Lemoine. He traveled widely, and is said to have visited Asia and Africa. When his former pupil, William Briçonnet, became Abbot of the Parisian Benedictine Abbey of Saint-Germain-des-Prés in 1507, he secured for Faber a home there, which he retained till 1520. Then he became director of the leper hospital at Meaux. His works were obnoxious to some of the Church authorities, but he was safe from molestation under the King's authority till Francis I. was taken prisoner at Pavia in 1525. Faber was then formally condemned, and his works were suppressed. He fled to Blois and to Guienne, or, according to some accounts, to Strassburg. On the return of Francis such proceedings were stopped, and he was made tutor of the King's children and Royal Librarian at Blois. When the Princess Margaret became Queen of Navarre she received Faber in her city of Nérac, and there he passed his old age in quiet. He died there in 1536. Among Faber's works were the *Physics*, *Metaphysics*, and *Ethics* of Aristotle, and a psalter in five languages. In 1512 he issued a translation into French of the Epistles of Saint Paul, in 1523 of the whole New Testament, in 1528 of the Pentateuch, and in 1530 of the entire Bible. These translations were from the Vulgate, with reference, however, to the originals, and corrections where Faber deemed them necessary. He also added short notes and comments. Faber's work has been the basis of all subsequent French versions. For his life, consult De Labatier Plantin (Montauban, 1870), and Prossdij (Leyden, 1900).

FABER, fä'bẽr, Johann Lothar (1817-96). A German manufacturer. He was the proprietor of a small lead-pencil manufactory at Stein (Bavaria), which he enlarged to international proportions. He established offices in Berlin, Paris, London, and New York, and additional manufactories at Geroldsgrün (Upper Franconia, Bavaria), Noisy-le-Sec, near Paris, and New York (with cedar yard and mills at Cedar Keys, Fla.). To the manufacturing of lead-pencils he added that of all sorts of writing, drawing, and painting materials. He received a patent of nobility and an appointment as counselor of State for his services to German industry.

FA'BER, or **FABRI,** fä'brê, Johannes (1478-1541). A Roman Catholic bishop, called the 'Hammer of Heretics.' His family name was Heigerlin, which he changed to Faber. He was born at Leutkirch, near Lake Constance, in 1478. He studied theology and canon law in Tübingen and Freiburg in Breisgau, and became doctor in canon law. After parochial and cathedral service he was appointed in 1518 Vicar-General of the Diocese of Constance. He enjoyed the friendship of such men as Erasmus, Melanchthon, and Zwingli, and seemed likely to agree with them fully. But when the breach with the Church became too wide, he chose the side of the latter, and in 1522 issued a work against Luther, and ever afterwards was one of the most indefatigable, learned, and formidable opponents of the movement. His epithet comes from his work *Malleus in hæresin Lutheranam* (Cologne, 1524), but it is only one of many such writings. At the last disputation in Zurich (January, 1523) and the Diets of Nuremberg (1523), Speier (1529), and Augsburg (1530), he bore a leading part and won general applause. In 1531 he became Bishop of Vienna, and in this exposed position the Turks gave him as much to do as the Reformers. He died at Baden, near Vienna, May 21, 1541. His collected works, so called, but really only the homiletical, appeared in Cologne (3 vols., 1537-41). The polemical works, *Opuscula Quædam J. Fabri Viennensis* (Leipzig, 1537), are more valuable. There is no complete biography of him. A. Horawitz, in his *Johannes Heigerlin genannt Faber, Bishop von Wien, bis zum Regensburger Convent* (Vienna, 1884), traced his life to 1524 only.

FABER, John (the elder) (c.1660-1721). An English draughtsman and mezzotint engraver. He was born at The Hague, and settled in England between 1687 and 1698. He was especially celebrated for the small pen portraits on vellum which he drew from life. One of the finest examples of this kind is the portrait of Simon Episcopius in the British Museum. In 1712 Faber was employed at Oxford and at Cambridge to engrave a set of forty-five portraits representing the founders of the colleges. Other portraits engraved by him from life are those of Bishop Atterbury, Count Bothmer, John Caspar, Dr. Sacheverell, and Bishop Hough.

FABER, John (c.1695-1756). An English mezzotint engraver. He studied at Vanderbank's Academy, London. His work consists largely of portraits, of which four hundred and more have been preserved. These include plates of Ignatius Loyola (after Titian), Charles II. (after Lely), Carreras (after Sir Godfrey Kneller), and a series, "The Members of the Kit-Cat Club" (also after Kneller). Among the engravings of his which are not portraits are "Saint Peter" (after Vandyck), and "The Taking of Namur" (after Wyck). His works exhibit a high degree of excellence, and, when arranged chronologically, a constant improvement in technique. They represent admirably the English manner of portraiture characteristic of the period immediately following Kneller.

FA'BIAN. Bishop of Rome (236-50), as such reckoned among the popes. He fell as one of the first martyrs in the Decian persecution after an efficient pontificate.

FABIAN GENS. See Fabius.

FABIAN SOCIETY, The. An organization for the advancement of socialism. Thus far it has been the most important socialistic society in England. It started in London, but similar organizations are now found in many other cities.

In 1883 an American, Thomas Davidson, who chanced to be in London, held parlor conferences with a group of literary workers chiefly, on the social duties of the times. This group continued to hold informal conferences. Socialistic theories gradually gained the upper hand in one section, and it finally became definitely socialistic. The Society took its name from the Roman Fabius. In 1888 the society began holding public meetings. The addresses have since been published as the *Fabian Essays* (American edition, Boston, 1894). The society carries on an active propaganda through the press, free lectures, etc. It seeks the nationalization of land and of such industries as can be 'conveniently managed socially.' Rent and interest must be added to the reward of labor. The idle class must disappear and practical equality of opportunity be gained. The present leader of the society is the politician and writer Sidney Webb. See SOCIALISM.

FABII, fā′bĭ-ī, ARCH OF THE. A travertine arch on the Via Sacra, at the entrance to the Roman Forum, erected by Quintus Fabius Maximus Allobrogicus, about B.C. 120, to commemorate his campaign against the Arverni and Allobroges. The only remains are a few blocks of travertine discovered in 1882 near the site of the arch, which appears to have been of very simple architecture.

FA′BIUS. The name of one of the oldest and most illustrious patrician families of Rome. Three brothers of this name alternately held the office of Consul for seven years (B.C. 485-479). In 479 the Fabii, under KÆSO FABIUS VIBULANUS, migrated to the banks of the Cremera, a small stream that flows into the Tiber a few miles above Rome. Here, two years after, they were decoyed into an ambuscade by the Veientes, with whom they had been at war, and, with the exception of one member, who had remained at Rome, and through whom the race was perpetuated, the entire gens, consisting of 306 men, was put to the sword. The most eminent of the Fabii were QUINTUS FABIUS RULLIANUS—supposed to have been the first who obtained for himself and his family the surname of *Maximus*—and his descendant, QUINTUS FABIUS MAXIMUS VERRUCOSUS, named CUNCTATOR, 'the delayer.' The former was the most eminent of the Roman generals in the second Samnite War (c. 326-304 B.C.), and was twice dictator and six times consul. The latter, who, in the course of his career, was five times consul and twice censor, was appointed dictator immediately after the defeat of the Romans by Hannibal at Lake Trasimenus, in B.C. 217. The peculiar line of tactics which he observed in the second Punic War obtained for him the surname by which he is best known in history. Hanging on the heights like a thundercloud, to which Hannibal himself compared him, and avoiding a direct engagement, he tantalized the enemy with his caution, harassed them by marches and countermarches, and cut off their stragglers and foragers, while at the same time his delay allowed Rome to assemble her forces in greater strength. This policy—which has become proverbial as 'Fabian policy'—although the wisest in the circumstances, was appreciated neither in the camp nor at home; and shortly after, Marcus Minucius Rufus, master of the horse, was raised to an equal share in the dictatorship—a position, however, which he occupied for but a short time. During his fifth consulship (c. 210 B.C.) Fabius recovered Tarentum, which had long been one of Hannibal's important positions. He died in B.C. 203. C. FABIUS, surnamed PICTOR, executed upon the walls of the temple of Salus—dedicated by the dictator C. Junius Brutus Bubulus in B.C. 302—the earliest Roman paintings of which we have any record; and his grandson, QUINTUS FABIUS PICTOR, was the first writer of a Roman history in prose. The fragments of his *Annals* may be found in Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883).

FABIUS, THE AMERICAN. A name applied to Washington because, like Fabius Cunctator, he followed a policy of avoiding pitched battles, particularly in the campaigns of 1776 and the winter of 1778.

FABIUS, THE FRENCH. Anne, Duc de Montmorency, Grand Constable of France (c.1492-1567), so called from his policy of delay in Provence in 1536.

FABLE (from Lat. *fabula*, narrative, from *fari*, to speak; connected with Gk. *φάναι*, *phanai*, to say, Skt. *bhā*, to shine). A word of twofold signification. First, it is employed by some writers in a general sense to denote any fictitious narrative, as, for example, the incidents in an epic or dramatic poem. At one time, also, when the myths of the Greeks and Romans were thought to be satisfactorily accounted for by regarding them as conscious inventions of the ancient poets and priests, it was customary to speak of them as *fables*, but this application of the term is now abandoned by scholars. (See MYTH.) According to the second and more frequent signification of the word, it denotes a special kind of literary composition, either prose or verse, in which a story of some kind is made the vehicle for conveying a universal truth. It differs from a parable in this respect, that while the latter never transcends in conception the bounds of the probable or the possible, the former always and of necessity does. The peculiarity of the *structure* of the fable consists in the transference to inanimate objects, or, more frequently, to the lower animals, of the qualities of rational beings. By the very novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become transparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest in their representations. They seem to have sprung up in the East, and India was in all probability their home. From the rich collections of fables in the Sanskrit *Panchatantra* and *Hitopadeśa* (qq.v.) came, it would seem, the Æsopic beast-stories. Other celebrated Oriental collections of fables, based directly upon the Sanskrit, are those of Bidpai (q.v.), or Pilpai, and of the Arabian Lokman. Among the Greeks, the greatest name is that of Æsop (q.v.), whose fables, at a much later period, were versified by Babrius (q.v.). Among the Romans, Phædrus cleverly imitated Æsop, but with considerable modifications, thus giving a certain amount of independent value to his work. It is perhaps worth mentioning here that the well-known fable of the *Town Mouse and Country Mouse*, told by Horace, is of purely Roman origin, and is probably the only one in existence of which this can be affirmed.

Leaving the classical period, and before entering on the Dark Ages, we encounter the name of Aphthonius, who flourished in the early part of the fourth century, and who wrote indifferent fables in Greek prose; and still later, the name of Flavius Avianus, who composed forty-two, no better, in Latin elegiacs. During the Dark Ages the fable in various forms appears to have been cultivated in the monasteries, although nothing meritorious has survived; but later in the Middle Ages it acquired fresh life and vigor. The oldest known German fabulist is Stricker, who lived about the middle of the thirteenth century; but the famous mediæval fable of *Reineke Fuchs*, or the History of Reynard the Fox (q.v.), stretches in some of its numerous primitive forms much further back. In later times most nations have cultivated the fable with more or less success. We may mention among the English, Gay; among the Germans, Hagedorn, Gellert, and Lessing; among the Italians, Pignotti; among the Russians, Kryloff; and above all among the French, La Fontaine (q.v.). Many of Andersen's wonder stories are fables, in which the weaknesses of human nature are treated with an exquisite humor and sarcasm, not inferior to those of La Fontaine.

The stories of Brer Rabbit and the other animals by Joel Chandler Harris (q.v.) do not belong under the fable proper, as they are not the invention of the writer, but are valuable records of the folk-lore (q.v.) of the African-Americans. The same is true of similar stories gathered from the Indian tribes.

Consult: Lessing, *Ueber das Wesen der Fabel* (1760); Robert, *Fables inédites des douxième, tresième, et quatorzième siècles, et fables de La Fontaine raprochées de celles de tous les auteurs* (Paris, 1825); Loiseleur Deslongchamps, *Essai sur les fables indiennes et sur leur introduction en Europe* (Paris, 1838); Bechstein, *Mythe, Sage, Märe und Fabel im Leben und Bewusstsein des deutschen Volkes*, 3 vols. (Leipzig, 1854-55); Benfey, *Pantschatantra* (Leipzig, 1859); Schlenker, *Collection of Temne Traditions, Fables, and Proverbs* (London, 1861); Bleek, *Reynard the Fox in South Africa* (London, 1864); Hervieux, *Les fabulistes latins depuis le siècle d'Auguste jusqu'à la fin du moyen âge*, 5 vols. (Paris, 1884-99); Weddigen, *Das Wesen und die Theorie der Fabel* (Leipzig, 1893).

FABLE FOR CRITICS, A. A satirical poem by James Russell Lowell (1848), reviewing American writers and critics.

FABLIAUX, få'blyō' (Fr., from OF. *fabliaus*, *fablel*, Prov. *fablel*, short story; connected with Lat. *fabella*, diminutive of *fabula*, story). Short stories in French verse, chiefly of the thirteenth century, adapted in part from Oriental and Latin sources, frankly coarse, often brutal, usually comic and satirical, often cynically skeptical and bitter in their treatment of women. They are realistic stories of every-day life, and give a melancholy, possibly too dark, picture of national morals. They appealed especially to the middle and lower classes, and have proved a storehouse to the novelists and dramatists of later times. From them Boccaccio, La Salle, Chaucer, Shakespeare, and Molière drew some of their best material. The best collection of them is the *Recueil général et complet des fabliaux des XIIIème et XIVème siècles*, by Montaiglon and Raynaud (6 vols, Paris, 1872-90). Consult Gaston Paris, *Les Contes orientaux dans la littérature française* (Paris, 1877), and Bédier, *Les fabliaux* (Paris, 1893), as well as his chapter in Petit de Julleville, *Histoire de la langue et de la littérature française*, vol. ii. (Paris, 1896), in which is a good bibliography.

FABRE, få'br', Ferdinand (1830-98). A French novelist, distinguished for his psychologic analysis of priestly character. He was born at Bédarieux, studied theology and law, but failed in health, and after a prolonged residence in southern France turned his observations to literary account in *Les Courbezon, scènes de la vie cléricale* (1862), whose minute analysis made him seem to Sainte-Beuve 'a strong pupil of Balzac.' Rustic sketches as minute in their observation followed. His most noteworthy novels are *Mon oncle Célestin: mœurs cléricales* (1881), and *L'abbé Tigrane, candidat à la papauté* (1873), both clerical in subject and both translated into English. All his novels are directed, in one way or another, against ascetic pride and self-deception. They show a robust, healthy sympathy with life, a rather heavy playfulness, and a divination of the celibate clerical mind that is unique in this generation. His mountaineer peasants, too, are striking types of intense and violent simplicity, whether of Rabelaisian animalism or of half-mystic saintliness. His stories of Parisian life are negligible.

FABRE, François Xavier Pascal (1766-1837). A French painter, born at Montpellier. He was a pupil of David, and won the Prix de Rome in 1787. Afterwards he lived in Florence, where he principally painted portraits, and became professor at the Academy. It is supposed that he privately married the Duchess of Albany, the widow of the 'Young Pretender,' who at her death made him her sole heir. The collection of works of art she left him he added to considerably, and bequeathed to the city of Montpellier to form the nucleus of the Musée Fabre. He also established a school of design at Montpellier in connection with the museum, and was himself its first director. Most of his works are at Montpellier. They include "Death of Abel," "Saul's Remorse," and a portrait of Canova. His "Neoptolemus and Ulysses" is in the Louvre. The paintings of Fabre are highly finished and rich in color.

FABRE, Marie Joseph Victorin (1785-1831). A French poet, born at Jaujac (Ardiche). The brilliant success he achieved in his youth, with his *Eloge de Boileau* (1805), which was crowned by the Academy, did not continue beyond a few years. He died, it is said, practically forgotten. His works were collected by one of his pupils, J. Sabbatier (1844-45). They include the best poems, *Discours en vers sur les voyages* (1807), *Eloge sur Pierre Corneille* (1808), *La mort de Henri IV*. (1808), and *Opuscules en vers et en prose* (1806).

FABRE D'EGLANTINE, få'br' då'glän'tēn', Philippe Francois Nazaire (1755-94). A French dramatist born at Carcassonne. He was an actor in his youth, and did not establish himself in Paris until 1787. During the next seven years he produced 27 plays, the best known of which are *Le Philinte de Molière*, or *La suite du Misanthrope* (1790); *Le convalescent de qualité* *ou l'aristocrate* (1791), and *Les précepteurs*, a posthumous comedy (1799). He was an ardent Revolutionist, a friend of Danton and Desmoulins and president of the Cordeliers. Sent as a Deputy to the Convention, he voted for the death of the King. He was accused of corruption by his enemies and of moderation by Robespierre, and with Danton and Desmoulins was condemned and executed.

FABRETTI, fȧ-brĕt′tē, Ariodante (1816-94). An Italian antiquary. He was born at Perugia, and became professor of archæology in the University of Turin, in 1860, and director of the Museum of Antiquities there in 1868. He was the author of *Corpus Inscriptionum Italicarum Antiquioris Ævi* (1867), and many works on the history and antiquities of Perugia. He was made a Senator of Italy in 1889.

FABRETTI, Raffaele (1618-1700). A distinguished Italian antiquary and archæologist, born at Urbino. While a student of law at Rome he was attracted to the study of the ancient ruins, and from that time devoted himself, as far as possible, to classical and antiquarian research. Under Pope Alexander VII. he became treasurer and subsequently auditor to the Papal Embassy at Madrid. After thirteen years at Madrid he returned to Rome, taking advantage of his journey through Spain and France to become acquainted with the Roman remains of those countries. He was there made judge. Later, after a short residence at the Papal Legation in Urbino, he returned once more to Rome, and devoted himself to his favorite pursuits until he was appointed by Innocent XII. keeper of the Papal Archives of the Castle of Saint Angelo—a post of great responsibility, which he held till his death, in 1700. His more important works are: *De Aquis et Aquæ Ductibus Veteris Romæ*, in Grævius, *Thesaurus*, vol. iv. (1680); *De Columna Traiani Syntagma* (1683; 2d ed. 1790), containing also a discussion of the so-called *Tabula Iliaca;* and *Inscriptionum Antiquarum Explicatio* (1699). His collection of inscriptions and monuments is deposited in the Ducal Palace of Urbino.

FABRI, fä′brē, Felix (German name, *Schmid*) (?-1502). A German monk and author. He was lector in the Dominican monastery in Ulm, and made two voyages to the Holy Land, the first to Jerusalem (1480), and the second (1483), upon which he had entered as chaplain to Johann von Waldburg, to Jerusalem and Mount Sinai, and thence by way of Cairo and Alexandria to Venice, where he arrived January 8, 1484. After his return to Ulm he published an account of this tour, which is probably the most important work of the kind that appeared during the latter part of the Middle Ages. The German version was published in Feyrabend's *Reyssbuch dess heiligen Lands* (Frankfort, 1584), the Latin version in the *Bibliothek des litterarischen Vereins* (Stuttgart, 1843-49).

FABRI, Friedrich (1824-91). A German theologian and promoter of colonization. He was born at Schweinfurt, and was educated at Erlangen and Berlin. After holding several pastorates he was appointed director of the Missionary Society at Barmen in 1857. He retained this post until 1884, when he retired to Godesberg-on-the-Rhine, where he developed a beneficent activity as president of the Evangelical Society for the German Protestants in America. He became professor at Bonn in 1889, and attracted attention by his writings on Germany's colonial policy, of which the most important are *Bedarf Deutschland der Kolonien?* (3d ed. 1884); *Fünf Jahre deutscher Kolonialpolitik* (1889). His other literary works include: *Briefe gegen den Materialismus* (2d ed. 1864); *Die Entstehung des Heidentums und die Aufgabe der Heidenmission* (1859); *Die politische Lage und die Zukunft der evangelischen Kirche in Deutschland* (3d ed. 1874); *Staat und Kirche* (3d ed. 1872).

FABRIANO, fä′brē-ä′nō. A city in central Italy, at the foot of the Apennines, 44 miles southwest of Ancona (Map: Italy, G 4). In the city hall and in several churches and private houses are paintings by the local school of which Gentile da Fabriano (1370-1451) was the head. The paper and gunpowder manufactories of the city have been famous since the fourteenth century. The chief trade is in grain and cattle. Population of commune, in 1901, 21,096.

FABRIANO, Gentile da. See Gentile da Fabriano.

FABRICE, fȧ-brēs′, Georg Friedrich Alfred, Count (1818-91). A German soldier and statesman, born at Quesnoy-sur-Deule, France. In 1834 he entered the cavalry service of Saxony, and by 1865 had become chief of the General Staff, with rank of major-general. When Saxony joined Austria against Prussia in 1866, he was appointed chief of staff to the Crown Prince Albert, commander of the forces of Saxony in Bohemia. After the war, in October of that year, he became Minister of War of Saxony. He acted as the representative of Saxony in the negotiation of the military convention with Prussia, and reorganized the Army of Saxony, after the Prussian type, as the Twelfth Army Corps of the Army of the North German Confederation. He took a prominent part in the Franco-German War, and in 1871, after the preliminaries at Versailles, which he largely conducted, he was in command of the German army of occupation in France, and later in the same year was a second time appointed Minister of War of Saxony. He became Prime Minister of the Kingdom and Minister for Foreign Affairs in 1876. Consult Dittrich, *General von Fabrice* (Dresden, 1884).

FABRICIAN (fȧ-brĭsh′an) **BRIDGE.** A stone bridge at Rome, joining the island of Æsculapius with the left bank of the Tiber, built by Lucius Fabricius in B.C. 62, to replace a wooden bridge dating from about B.C. 192. It is the only ancient Roman bridge that has endured. Of its four arches, one is hidden by the modern embankment. It is now the Ponte Quattro Capi.

FABRICIUS, fȧ-brē′tsē-o͞os, David (1564-1617). A German theologian and astronomer, born at Esens, East Friesland. In 1584 he became pastor at Resterhaave, and in 1603 at Osteel, where on May 7, 1617, he was murdered by a peasant, whom he had accused from the pulpit of theft. The variable star Mira, in the constellation Ceti, was discovered by him, August 3, 1596; and his astronomical and meteorological observations were of service to Kepler in the investigation of the planet Mars. In 1895 a monument was erected to his memory in the churchyard of Osteel.

FABRICIUS, fȧ-brĭsh′ŭs, Gaius Fabricius Luscinus. A Roman general and statesman of the fourth and third centuries B.C., who became for later ages a model of incorruptibility. In 282 he was consul, and again in 278. He commanded in the war against Pyrrhus (q.v.), and when, after the defeat of the Romans at Heraclea in 286, he was sent to treat for the ransoming of the prisoners, Pyrrhus sought to bribe him in order to gain a favorable peace, Fabricius scorned the bribe, and made such an impression on the King that the Roman prisoners were immediately released. On another occasion the physician of Pyrrhus offered to Fabricius to poison his master; but the upright Roman sent information of the treachery to the King, whereupon Pyrrhus again released all his Roman prisoners, in order not to fall behind in this contest of generosity. In 276 Fabricius was censor, together with Quintus Æmilius Papus, and as such carried out with great rigor the old Roman sumptuary laws.

FABRICIUS (Goldschmid), Georg (1516-71). A German scholar and Neo-Latin poet, born in Chemnitz, Saxony. He became rector of the College of Meissen in 1546, and in 1570 was appointed poet-laureate by Maximilian II. He owes his reputation to his Latin poetry, published in *Poematum Sacrorum Libri XV.* (1560). He also prepared an edition of the scholia to *Horace* (1555). He wrote three elaborate works on Roman archæology, *Antiquitatum Libri II.* (1549), *Itinerum Liber Unus* (1551), and *Roma* (1551). Consult Baumgarten-Crusius, *De Georgii Fabricii Vita et Scriptis* (Meissen, 1839).

FABRICIUS, or **FABRIZIO**, fȧ-brē′tsê-ō, Girolamo (1537-1619). An Italian anatomist and surgeon, commonly named, from his birthplace, Fabricius ab Aquapendente. He was the son of humble parents, who sent him to the University of Padua, where, in addition to the usual instruction of the classics, he studied anatomy and surgery under Fallopius. On the death of the latter, in 1562, Fabricius was appointed to fill the vacant professorship. He continued to hold this office for nearly half a century, during which period his high reputation for eloquence, general and professional knowledge, attracted students from all parts of the civilized world to Padua. Among these students was Harvey (q.v.), who derived from Fabricius's observations on the valves of the veins the first clue to his great discovery of the circulation of the blood. Fabricius was a most laborious student of comparative anatomy, from the standpoint of which he treated the eye, the larynx, the ear, the intestinal canal, the development of the fœtus, and many other subjects. The improvements which his knowledge of anatomy enabled him to introduce into the practice of surgery were very great; and his *Opera Chirurgica* (1617), which embraced every complaint curable by manual operation, passed through seventeen editions. The Venetian Republic erected for him a spacious anatomical amphitheatre, gave him an annual stipend of a thousand crowns, and created him a knight of the Order of Saint Mark.

FABRICIUS, Hildanus, properly Wilhelm Fabry (1560-1634). A German surgeon. He was born at Hilden, near Düsseldorf, and was educated at Cologne. After practicing at Lausanne and at Payerne (Canton of Waadt) he became physician of the city of Bern, where his great renown as a teacher and operator attracted students from all parts of Europe. Besides his work *Observationum et Curationum Chirurgicarum Centuriæ* (Lyons, 1641), he wrote *De Gangræna et Sphacelo* (1593); *Lithotomia Vesicæ* (1626); and the treatise entitled *Kurze Beschreibung der Fürtrefflichkeit, Nutz und Notwendigkeit der Anatomey* (1624), in encouragement of the study which he persistently advocated.

FABRICIUS, *Ger. pron.* fȧ-brē′tsê-o͞os, Johann Albert (1668-1736). A German scholar, born at Leipzig. He stands preëminent among scholars for his two literary synopses, *Bibliotheca Latina* (1697, revised and improved by Ernesti, Leipzig, 1773), and *Bibliotheca Græca* (1705-28, revised by Harles, Hamburg, 1790), his greatest work. He is known among theologians for his collections of the apocryphal and pseudepigraphical literature (1703 and 1713). Consult Micéron, *Mémoires des hommes*, vol. xi. (Paris, 1739).

FABRICIUS, Johann (1587-c.1615). A German astronomer. He was born in East Friesland, studied medicine at Wittenberg, and was afterwards educated in astronomy by his father, David Fabricius. He appears also to have spent some time in Holland, and to have obtained there for his father one of the earliest specimens of the astronomical telescope. In his famous work, *Narratio de Maculis in Sole Observatis et Apparente Carum cum Sole Conversione*, published at Wittenberg in 1611, he announces his discovery of the solar spots and of the rotation of the sun on its axis. In his letters to Marcus Velserius (Markus Welser), not published until 1613, Galileo claims to have discovered the solar spots in November, 1610. It is probable, therefore, that the honor of priority remains with Fabricius.

FABRICIUS, Johann (1644-1729). A German theologian, born at Altorf, near Nuremberg, and educated at Nuremberg, Helmstedt, and Altorf. In 1677 he became professor of theology at Altorf, and in 1697 was called in the same capacity to Helmstedt. In 1701 he was appointed Abbot of Königslutter, and in 1703 Counselor of the Consistory of the Dukedom of Brunswick. On comparative symbolism he wrote *Consideratio Variarum Controversiarum cum Atheis, Gentilibus Judæis, Mohammedanis, Socianis, Anabaptistis, Pontificiis, Reformatis* (1704; abridged ed., 1715), which so incensed the strict Lutherans that Fabricius was bitterly attacked on all sides. His *Gutachten* (1704), in which he most decidedly recommended the Princess Elizabeth Christine of Brunswick to embrace Romanism, in order to be married to Charles of Spain (afterwards the Emperor Charles VI.), caused great scandal, and brought about the dismissal of Fabricius from the university.

FABRICIUS, Johann Christian (1743-1808). A German entomologist, born at Tondern in Schleswig. He studied at Copenhagen, Leyden, Edinburgh, Freiberg in Saxony, and Upsala, where he was a pupil of Linnæus. In 1775 he became professor of natural history at the University of Kiel. He developed a system for the classification of insects, based upon the structure of the mouth-parts, which had an important influence upon the development of the science. His principal works are: *Systema En-*

tomologica (1775); *Philosophia Entomologica* (1778); *Supplementum Entomologiæ* (1797).

FABRONI, fȧ-brō′nē, ANGELO (1732-1803). An Italian biographical writer, born at Marradi, in Tuscany. He was educated at Faenza and Rome, and in 1773 was appointed tutor to the sons of Leopold, Grand Duke of Tuscany. His *Vitæ Italorum Doctrina Excellentium qui Sæculo XVII. et XVIII. floruerunt* (20 vols., 1778-1805) is one of the best Italian works of its kind and contains quite a treasure of information; while his *Laurentii Medicei Vita* (1784) and *Vita Magni Cosmi Medicei* (1788-89) are reckoned model biographies.

FABRONI, or **FABBRONI**, GIOVANNI VALENTINO MATTEO (1752-1822). An Italian chemist, naturalist, and engineer, born in Florence. As the friend and collaborator of Fontana he became director of the physical cabinet of the Grand Duke of Tuscany. He was appointed by Napoleon director of the roads and bridges leading beyond the Alps. The construction of the pass across Mont Genèvre, and the Corniche, the celebrated road leading from Nice to Geneva, was carried out by him. He worked in almost every field of science, so that Cuvier dubbed him a 'living encyclopædia.' He wrote many useful treatises on botany, chemistry, rural economy, such as *Antichità vantaggi e metodo della pittura encausta* (1797); *Degli antichi abitatori d'Italia* (1803); and *Ricerche sulla Quina* (1803).

FABRY, fä′brê, WILHELM. See FABRICIUS, HILDANUS.

FABULOUS ANIMALS. See BESTIARIES; GRIFFIN; UNICORN; FABLES; HERALDRY.

FABVIER, fä′vyâ′, CHARLES NICOLAS, Baron (1783-1855). A French general and Philhellene. He was born at Pont-à-Mousson, and in 1807 was sent by Napoleon to Constantinople to fortify that city in preparation against an attack by the English fleet. He later organized a park of artillery at Ispahan, Persia, for defense against Russia. He was the adjutant of General Marmont in Spain in 1811, and in 1813 was advanced to the rank of colonel on the General Staff. In consequence of political persecution on the part of the Royalists, he subsequently went to England, and in 1823 to Greece to participate in the War of Greek Independence. He was appointed commander-in-chief of infantry, but failed to retain the confidence of the Greeks, because of the unfortunate expedition to the island of Chios and the loss of the Acropolis; and in 1829 he returned to Paris, where he became chief of staff to the National Guard. In 1848 he was sent as Ambassador to Constantinople. His publications include *Journal des opérations du VI. corps pendant la campagne de 1814 en France* (1819).

FA′BYAN, or **FABIAN**, ROBERT (?-1513). An English chronicler. His *New Chronicles of England and France*, first published in 1516, begin with the arrival of Brutus and extend to the battle of Bosworth (1485). His aim was to harmonize the accounts of previous writers, but his efforts in this direction were rendered almost valueless by his lack of judgment and his inability to sift evidence. He is valuable as an authority only for the affairs of London during his own time. The chronicle was continued by others in successive editions until 1558, and in 1811 an edition was issued by Ellis.

FAÇADE, fȧ-sȧd′ *or* fȧ-sād′ (Fr., front of a house). The exterior front or face of a building. The back elevation of an important building is sometimes called the rear façade, and an edifice may have as many façades as it shows extensive flat architectural faces with individual treatment. Thus a Gothic cruciform church commonly has three façades, namely, the west or main front, and the ends of each transept; in a Greek temple the two short gable ends are façades, while the two long sides are merely flanks. An elevation of the side of a building is called the *lateral* façade. The sides of a court or cortile are often called façades, but this is an incorrect application of the term. Beside the normal façade, which follows substantially the outlines of the structure back of it, there is what is called the *false façade*, which is composed largely for its own sake and with independent outlines, as was so often the case in mediæval churches. These are called *screen* façades when they form an oblong surface projecting far above the aisles, as is the case in Italy with some Tuscan churches, at Pisa and Lucca, at Aquila (Collemaggio), in English cathedrals, as at Peterborough and Lincoln, and in many Romanesque churches of France. Such a method was apparently unknown in ancient and early Christian architecture.

FACATATIVÁ, fä′-kȧ-tä′tê-vä′. A town in the Department of Cundinamarca, Colombia, about 20 miles northwest of Bogotá (Map: Colombia, C 3). It lies about 8500 feet above sea level, and was a fortress of the Chibcha Indians, whose last chief, Triquesupa, was killed here by a soldier under Quesada in 1538. The town derives some commercial importance from its proximity to the capital. Population, about 8000.

FACCIOLATI, fä′chô-lä′tê, JACOPO (1682-1769). An Italian philologist and lexicographer. He was born at Torreglia, not far from Padua, and was educated at Padua, where he became professor of logic, and later rector of the Institution. He directed his attention chiefly to the revival of the study of ancient literature, and with this object brought out a new edition of the *Lexicon Septem Linguarum*, called, from its original author, the monk Ambrosius of Calepio, the *Calepine Lexicon*. He was assisted in this work by his pupil, Egidio Forcellini, to whom is mainly owing the conception of a totally new Latin dictionary—an arduous undertaking, which Facciolati continued till his death in 1769, and which was afterwards completed by Forcellini in 1771. Facciolati and Forcellini, assisted by several others, likewise published a new edition of Nizoli's *Thesaurus Ciceronianus*. The great *Totius Latinitatis Lexicon* of Facciolati and Forcellini is still useful in the revision of De Vit (Prato, 1858-87). See FORCELLINI.

FACE. The servant of Lovewit, in Ben Jonson's play *The Alchemist*. With Subtle, a beggar who poses as an alchemist, and Dol Common, he uses his master's house during the latter's absence to cheat his dupes by pretended fortune-telling and magic.

FACETIÆ, fȧ-sē′shĭ-ē (Lat., witticisms). A collection of witty sayings and short tales in prose or in verse. A Greek collection of this kind called *Asteia* (ed. by Eberhard, Berlin, 1869) was attributed to Hierocles (q.v.). Facetiæ were common in the late mediæval Latin writers; but the first book devoted wholly to them seems to have been the *Liber Facetiarum* of Poggio Bracciolini (Rome, 1470). For the jest in modern literature, see JEST.

FÂCHEUX, fȧ′shẽ′, LES (Fr., The Bores). A comedy by Molière (1661). Its plot is concerned with the interruptions, by certain tiresome people, of the love-making of the hero and heroine, and it contains a caricature of M. Le Soyecourt, the noted chief huntsman in the court of Louis XIV.

FACIAL ANGLE. See ANTHROPOMETRY.

FACIAL NERVES. The seventh cranial nerve in Sömmering's classification is the motor nerve of the face. It originates in the medulla oblongata, passes through the temporal bone, and issues from the skull through the stylomastoid foramen. It then branches over the superficial portions of the face, and innervates the muscles of expression, as well as the buccinator of the face and other muscles. It was formerly classed as a portion of the seventh nerve, the *portio dura*, the other portion being the *portio mollis*, or auditory nerve. According to Willis the sensory nerve of the face is the trigeminus, or trifacial nerve, known as the fifth in Sömmering's list. It has three branches: (1) the ophthalmic, which passes to the eyeball, the brow, the forehead, and the nose; (2) the superior maxillary, which supplies the side of the nose, the lower eyelid, and upper lip; (3) the inferior maxillary, which supplies principally the teeth and gums of the lower jaw and the lower lip. For the deep origin and exact description of these nerves, consult Gray, *Anatomy* (London, 1901).

FACIAL NEURALGIA. A paroxysmal pain in the head and face, in the parts to which the trifacial or trigeminal nerve runs. (See FACIAL NERVES.) There are two varieties: (1) *Symptomatic facial neuralgia*, with pains sharp and intense, often lasting for many days without ceasing, or disappearing and returning frequently. It is caused by anæmia, exposure, bad teeth, gout, rheumatism, diabetes, syphilis, malaria, hysteria, epilepsy, injury, or septic poison. Application of heat or of menthol may relieve, or quinine, arsenic, or aconitia (a dangerous drug), with treatment of the cause. (2) *Tic douloureux*, a very intense form, in which the pains last a few moments each time, recurring on moving the tongue or chewing, in a draught, etc., and dependent upon a neuritis or degenerative process in the nerve. Salicylates, injections, or electrical diffusion of cocaine or iodides may relieve. Removal of a part of the nerve or of a ganglion connected with the nerve may be required.

FACIAL PARALYSIS. Paralysis of the facial nerve on which depends the power to move the muscles of the face. One or both sides of the face may be thus affected. The paralysis may be central, due to disease of the brain; or peripheral, and due to disease of the nucleus from which the nerve springs, or of the nerve itself. The latter is the frequent type, and is called 'Bell's palsy.' In this form there is paralysis of one side of the face, which comes on rapidly, the face being drawn to the unaffected side, while the eye of the affected side remains open, the tongue deviates to the affected side, and saliva drips from the angle of the mouth. The patient cannot whistle. Food collects between the cheek and the gums on the affected side. Taste is lost in many cases on the anterior part of the tongue on the affected side. Electrical contraction of the affected muscles is abnormal, and in time reveals degeneration of the nerve-tissue. Bell's palsy is caused by gout, exposure, syphilis, or middle ear disease, etc. The treatment usually consists in the administration of iron and strychnine, and the application of galvanism over the 'motor points' of the individual muscles thus affected. A hook of protected wire worn over the ear and holding up the angle of the mouth may be of use in some cases. The cause must also be treated. Recovery is the rule.

FACINGS, MILITARY. The collars and cuffs, usually of military uniforms, the color of which denotes the branch of the service to which the wearer belongs. In the United States the facings of infantry were white, cavalry yellow, and artillery red. The uniform regulations of 1902 substituted for the facings cuffs and collars piped with the appropriate color. This was changed to light blue instead of white for the infantry. The system is more complicated in the British Army, owing to the fact that all regiments bearing the title of 'Royal' have blue facings independent of the fact of their nationality. Ordinarily English regiments have white facings, Scottish yellow, and Irish green. See UNIFORMS, MILITARY.

FACINO CANE, fȧ-chẽ′nȯ kä′nȧ. A tale by Balzac, setting forth the story of the author's struggles (1836).

FACSIMILE (abbreviation of Lat. *factum simile*, made like). An exact copy, especially of handwriting, or of printed works, engravings, inscriptions, manuscripts, and the like.

FACTOR (Lat., a maker, from *facere*, to make). In arithmetic, any one of the integral numbers whose product is a given number is called a factor of that number; e.g. in $72 = 4 \cdot 9 \cdot 2$ 4, 9, 2 are the factors of 72. A prime factor is a factor which is a prime number. In algebra the factors of a rational integral algebraic expression are the rational integral expressions which, multiplied together, produce it; e.g. in $x^6 - y^6$, the factors are $(x - y)$, $(x + y)$, $(x^2 + xy + y^2)$ $(x^2 - xy + y^2)$. The second pair of factors can be factored further, but not into rational factors. Thus the expression is said to be fully factored in the domain of rationality. The highest common factor in algebra is the factor of highest degree common to the given expressions, and although it corresponds to the greatest common divisor in arithmetic, it must not be confounded with it. If numbers be substituted for letters the value of the highest common factor is not always the greatest common divisor of the values of the given expressions; e.g. the highest common factor if $x^2 - 3x + 2$ and $x^2 - x - 2$, is $x - 2$. Let $x = 31$, then the values of the expressions are 870, 928, whose greatest common divisor is 58, but $x - 2$ is only 29. See also DIVISION.

FACTOR. An agent employed to sell the goods or another; in the United States such an agent is usually called a commission merchant, because he has his compensation in a commission or percentage upon the goods he sells. He differs from a broker in that he has actual possession of the goods of his principal, and is empowered to deliver them to the purchaser as if they were his own. He often buys and sells in his own name, so that those dealing with him may not know whether he is owner or factor. Under some limitations for self-protection, he is bound by the instructions of his principal and responsible for damages arising from a violation thereof. As a rule he must obey special instructions, and if none are given, he is bound to use all reasonable care in the management of the property committed to his charge, to employ the usual methods of business, and to have due regard to the interests and welfare of his employer. Otherwise he is not entitled to his commissions, and for injurious neglect of duty may even be sued by his principal. He cannot delegate his authority without express permission of his principal unless such delegation is justified by general usage or by stress of peculiar circumstances. He cannot sell goods at a sacrifice for the purpose of obtaining his commission and advances. It is generally held that a factor who has made advances upon goods acquires such an interest in them that the principal cannot take them out of his possession by a revocation of his authority. The factor can sell enough of them to reimburse himself if the principal unreasonably neglects or refuses to pay him. Sometimes, in consideration of an increased commission, he guarantees to the principal payment for the goods which have been sold. In that case he acts under a *del credere*, or guaranty, commission, and is in general subject to most of the obligations of a surety. It was formerly held that a factor whose principal resides in a foreign country is personally liable to the other party, even though the foreign principal was disclosed. The modern view is, however, that a factor who names his principal is not personally liable on contracts made for his principal, whether foreign or domestic, provided they are within the factor's authority and do not profess to bind him personally. See AGENT. Consult: Mechem, *Treatise on the Law of Agency* (Chicago, 1889); Evans, *Treatise on the Law of Principal and Agent* (New York and Albany, 1891).

FACTOR ACTS. The legal designation of a series of modern statutes in England and America, conferring upon agents who are intrusted with the possession of goods the authority to vest a good title thereto in an innocent purchaser. At common law a factor (q.v.) had no implied authority to pledge or barter his principal's goods. Even when they were shipped to him, and their possession as well as the bill of lading or other document of title intrusted to him, he had not the legal power to pledge or barter them. The common-law doctrine, that a person cannot give a better title than he possesses, enabled the principal to recover his property from a pledgee, although the latter had advanced money to the factor in the honest belief that he was the true owner. The inconveniences resulting from this principle, with the opportunities for fraud which it permitted, led the mercantile and banking community to demand that a person into whose possession goods or documents of title were put by the true owner be treated as having unqualified power to dispose of them. Partial effect was given to this view in England by the Factors Act of 1825 (Geo. IV. c. 94), and in a few of our States by legislation fashioned after that statute. Under these acts, factors or agents of a similar character, who are intrusted with the possession of goods or the documents of title thereto for the purpose of sale, are to be deemed the true owners, so far as to give validity to any sale or pledge made by them to an innocent purchaser or pledgee for value. In England the new doctrine has been carried even further than this The courts there, as here, having construed the earlier acts very strictly, the mercantile community has insisted upon their repeated revision; each new statute going further than its predecessor toward the substitution for the common-law rule, stated above, of the doctrine which prevails upon the Continent of Europe, that any one in the possession of goods, with the consent of the owner, whether a factor or not, shall be able to give a perfect title thereto to an innocent purchaser for value from him. This legislation, taken with that upon conditional sales, has practically abrogated, so far as personal property is concerned, the former doctrine of the common law that the purchaser of property buys it at his peril, and gets only such title as his vendor has to give. See CAVEAT EMPTOR. Consult: Chambers, *Sale of Goods Act* (London, 1899); Kerr Pearson-Gee, *Commentary on the Sale of Goods Act* (London, 1893); Burdick, *The Law of Sales of Personal Property* (Boston, 1901); Benjamin, *Treatise on the Law of the Sale of Personal Property* (London, 1900).

FACTOR OF SAFETY. See STRENGTH OF MATERIALS.

FACTORIES AND THE FACTORY SYSTEM. A factory may be defined as an establishment where a number of persons coöperate by consecutive processes in the production of some article of consumption. Carroll D. Wright, in his report on the factory system for the Tenth United States Census, uses the following definition, which he borrows from Taylor's *Factories and the Factory System*, published in London in 1844: "A factory is an establishment where several workmen are collected for the purpose of obtaining greater and cheaper conveniences for labor than they could procure individually at their own homes; for producing results by their combined efforts which they could not accomplish separately; and for preventing the loss occasioned by carrying articles from place to place during the several processes necessary to complete their manufacture."

HISTORICAL DEVELOPMENT. As is the case with most other great industrial movements, it would be difficult to assign to the origin of the factory system an exact place or date. The system originated in England in textile manufacture, during the latter half of the eighteenth century, but its germ already existed in the carding and fulling mills which had been common for many years previous. During the eighteenth century, however, a remarkable series of inventions was made, by which automatic machinery was introduced as a substitute for, or at least a supplement to, hand labor in the manufacture of cotton and woolen cloth. The history of these inventions, among the most important of which are those of Arkwright, Hargraves, Cartwright, and Crompton, is given elsewhere in the biographical sketches of their inventors and in the general articles on SPINNING and WEAVING. The importance of these inventions, not only industrially, but economically, can scarcely be overestimated, for by them not only was the cost of clothing wonderfully cheapened and physical comfort thereby increased, but a new system of industrial activity was developed which was destined to supplant the old system of master and apprentice, not only in the textile manufactures, but in nearly all branches of labor, from the making of a watch to the slaughter of live stock. This change was a necessary accompaniment to the use of the new inventions, for machinery of itself is too expensive, and its use involves too large an outlay for raw material and for disposing of the finished product to make it available to the independent artisan.

The introduction of automatic textile machinery was accompanied by the opposition, and by the persecution of its promoters, which have characterized most of the great movements for the world's betterment. At first, too, the new system met with failure from another source, the lack of sufficient capital and of a sufficiently large group of laborers to render profitable or even possible the installation of the more expensive power-driven machinery. Only water-power was available to drive the machinery, hence the operator must locate his factory, not at some important industrial centre, but at a spot where sufficient supply of water-power was available, and this might be an isolated place where labor was scarce. It is interesting to note that some of England's earliest factory legislation, as the Robert Peel act of 1802, was directed toward correcting the abuses in the employment of pauper and more especially child labor by these early operators, who could not procure in the neighborhood of their factories sufficient adult labor to run their machines. If, then, the first step in the introduction of the factory system was the invention of automatic machinery—in distinction from tools—the second step was the application of steam as a motive force to drive this machinery. The use of steam at once freed the operator from geographical restrictions and made it possible for him to locate his factory where both labor and the demand for its fruits were most abundant.

But with the slow, cumbrous, and expensive methods of transportation that were in vogue until the close of the eighteenth century the factory system could not have attained its present proportions. The output must have been regulated largely by the local demand. Hence the third step in the development of the modern factory system was made possible by the introduction of the steamship and the railway, by means of which the products of any locality could be sent quickly and cheaply to all parts of the world. But previous to the appearance of steam navigation, from 1767 on, the canal system was widely extended throughout England, and, by enabling the cheap distribution of coal and iron, proved of great importance to manufacturing in large factories.

A fourth factor in the development of the factory system was the evolution of the patent system. Automatic machinery presupposes the work of men of inventive genius, upon whose labors it is absolutely dependent. When the fate of such men was almost certain persecution and poverty an inventor must be a hero as well as a genius, and under such conditions inventions were few and far between. As Byrne points out in his *Progress of Invention in the Nineteenth Century*, until the close of the eighteenth century superstition had so strong a hold upon the human mind that inventions were almost synonymous with the black arts. A labor-saving machine was looked upon as the enemy of the working man, and many an earnest inventor, after years of arduous thought and painstaking labor, saw his cherished model broken up and his hopes forever blasted by the animosity of his fellow-men. But during the nineteenth century the patent system, which had long been in existence, was so fostered and developed by government that it became possible for a man not only to benefit his fellows, but to earn a comfortable and honorable livelihood by the exercise of his inventive faculties. Under this stimulating influence appeared a series of important inventions which resulted in the extension of automatic machinery, and hence of the factory system, which was at first limited to textiles, to all branches of industry. Chief among the multitude of important inventions which stimulated the development of the factory system were the planing-machine (1802), galvanized iron (1837), vulcanizing of rubber (1839), Howe's sewing-machine (1846), watch-making by machinery (1850), Bessemer process of making steel (1855), paper from wood-pulp (1850), McKay shoe-sewing machine (1861), roller-mill and middlings purifier for making flour (1875). A more complete list of important inventions, based, like the preceding, on patents issued in the United States, is given in the article on MANUFACTURES.

The conviction that the introduction of labor-saving machinery is prejudicial to the interests of the laborer still survives and is actively encouraged by some of the trades unions. In an article on the "Business of the Factory," published in *Scribner's Magazine* for 1897, Philip G. Hubert comments on this fact, and gives some interesting examples of its practical workings. "In some trades," he says, "the spirit that led to the breaking up of Arkwright's spinning frames because they did so much work survives. The shoemakers of Lynn have not yet dared to introduce a certain lasting-machine largely employed in Europe and in certain Western cities of this country because the lasters' trade union forbids its use. According to the leading shoemakers of Lynn this machine would revolutionize the business. It is evident that in a big manufactory it is not everything to invent a labor-saving machine; endless tact must be employed to induce the men to allow its use."

Although the four steps essential to the growth of the factory system—the introduction of automatic machinery, the application of steam as a motive force, improved methods of transportation, and an enlightened encouragement of the patent system—had all been taken at the beginning of the nineteenth century, the growth of factories was slow, even in England and the United States, where it was least opposed. At first England, in which the great textile machines were brought out, jealously guarded her treasures and passed severe laws prohibiting the exportation of machinery or models thereof. In spite of several attempts on the part of Americans to introduce English methods, the secrets were tolerably well kept until 1790. In that year a factory was built by Samuel Slater at Pawtucket, R. I., in which Arkwright's system of water-frame spinning was introduced. From that time the factory system, as applied to textiles, promoted by Whitney's invention of the cotton-gin in 1792, and by Lowell's introduction of the power-loom and other improvements in his factory at Waltham, has enjoyed uninterrupted progress and has powerfully influenced the development of the factory system in other lines. Carroll D. Wright says that the Lowell factory at Waltham, Mass., completed in the fall of 1814, "was the first in the world, as far as the records show, in which all the processes of converting raw cotton into the finished product were performed in one establishment, by successive steps, under one harmonious system."

Owing to different economic conditions, due to the difference between an old country where population centres are fixed and a new, where immigration and the rapid growth of the country makes any favorable site a possible centre of population, the development of the factory system in the United States was not only later, but also different in character from that in the mother country. Water-power continued to be the almost exclusive motive power, long after the application of steam was understood. It was the splendid water-power offered by the Merrimac River that determined the location of Manchester, Lowell, and Lawrence, and so powerfully affected the industrial growth of New England. It may be added that the inventions and achievements of the hydraulic engineer have been scarcely less essential to the development of America's factory system than those of the inventor of automatic machinery. Many of the experiments in hydraulic engineering which have been most fruitful were conducted in efforts to improve current methods of developing and applying water-power as a motive force for driving machinery. Within recent years the possibilities of utilizing water, especially at a long distance, have been enormously increased by transmitting power in the form of an electric current.

Outside of the cotton and woolen mills, the growth of the factory system in the United States was slow. Domestic and neighborhood industry continued to predominate, even in these industries, until 1830, and it was not until 1840 that the factory method extended itself widely to miscellaneous industries. It was in 1840 that Bigelow applied power-driven machinery to the weaving of carpets, and ten years later, at Waltham, Mass., automatic machinery was used for the first time, by consecutive processes, in a single manufactory, in the making of the most delicate of mechanical instruments, the watch. (See WATCH.) Gradually, with the invention of the requisite machinery, the new method of production was extended to other industries. During the last half of the century, and particularly after the close of the Civil War, factories of all kinds sprang up, first in New England and later in the West and South. The new system obtained little footing in the South until the very close of the century, when, tempted by the low cost of 'mountain white' and colored labor, much capital, largely from New England, was directed toward the establishment of factories in the South. By the close of the century the system prevailed throughout America and the greater part of Europe as the usual means of production, to the almost entire extinction of domestic and small-shop industries. Germany, in particular, experienced a great industrial awakening, toward the close of the century, and has so far outstripped England in the extent and variety of her factory products that the phrase 'made in Germany' is the bugbear of the English manufacturer. The nineteenth century also saw the establishment of the factory system in Japan and China. In the latter country the attempt has scarcely passed the experimental stage; for, though wages are low, labor is so unskilled and unreliable that, measured by the product, it is most expensive.

The great advances made in all departments of applied science during the century have already proved far-reaching in their effects upon the factory system. The use of electricity for long-distance transmission of power has already been mentioned. For distributing and applying power as well, electricity is proving an economical and convenient substitute for steam, and seems likely to do away with much of the cumbersome and uncleanly shafting and belting by means of which power is distributed through the ordinary factory. Edward Atkinson goes so far as to prophesy that the use of electric power, so easily transmitted and applied, will finally result in the dispersion to their own homes of the multitudes of workers now gathered in factories, and that the weaver will work at his own loom, and the spinner at his spindle in his own cottage, and a new form of power-driven household industry will supplant the factory system. Few will agree with Mr. Atkinson in thus forecasting the probable effect of electricity upon the factory system. The whole trend of modern industry is toward a still greater centralization of capital and labor. "The larger the plant the cheaper the product," says a prominent mill operator. Andrew Carnegie, writing on the development of the steel industry in the United States, puts the case still more forcibly when he says: "One essential for cheap production is magnitude; concerns making 1000 tons of steel per day have little chance against those making 10,000 tons. We see this law in all departments of industry. It evolves the 20,000-ton steamship and the 50-ton railway car. Improved engines and the use of electricity as a motor, the new loading and unloading machinery are all contributory causes to the cheapening of steel. . . . . Among those contributory causes," adds Mr. Carnegie, "automatic machinery ranks first and continuous processes next. Workshops 1100 and 1200 feet long are becoming common, in which the raw material (ore) enters at one end and emerges finished (steel billets) at the other without handling, and often without stopping except for reheating."

In one branch of industry, however, two other systems of production have flourished side by side with the factory system, although apparently antagonistic to it. These are the sweat-shop and tenement-house work in connection with the ready-made clothing industry. (See SWEAT-SHOP.) It is a curious fact that in all branches of the clothing industry—not only in the making of textile garments, but of hats, gloves, and shoes—home and small-shop labor have been strangely persistent. In the portions of the Twelfth United States Census devoted to investigating these industries, this fact is brought out. Certainly the abuses which have sprung up in connection with the manufacture of clothing outside of factories have been so grave and far-reaching as to make the alleged evils of the factory system seem but trifling in comparison.

In fact, the obvious and universally proposed remedy for the sweat-shop and for unsanitary tenement-house labor is the application of the full-fledged factory system to the manufacture of all parts and all kinds of garments. The history of clothing manufacture should furnish food for reflection to those economists who advocate the encouragement of household industries.

Having traced the fundamental causes which have produced the factory system, one is led to ask, what are the effects of this system industrially, economically, and sociologically, upon modern life? The old argument that the introduction of automatic machinery tends to displace labor has been disproved by the logic of events, and it is evident that it only tends to divert labor to other and more profitable channels. A more accurate timekeeper can now be produced in a watch factory for a few dollars and in a few hours than the skill of the Swiss watchmaker, whose family has been trained for generations to the work, can produce in as many weeks. But this cheapening and bettering of the product has so enormously increased the demand that a proportionately larger body of men are engaged in different branches of the business—from the inventing and making of the delicate machinery required to the selling of the finished product—than ever before. Although this may not be true in all branches of manufacture, yet the introduction of the factory system, by cheapening production, has so raised the standard of living and enlarged the number of industries that labor was never so much in demand nor so well paid as at present.

But while most people admit the great industrial advantages of the factory system, the nature of its economic and sociological tendencies, and especially of its intellectual and moral effects upon the factory employee, are disputed. It must be remembered that many of the evils which have accompanied the introduction of the factory system did not originate with it, but either descended from the older labor systems or are part of a widespread industrial movement. That employment of women and children preceded the factory system and gave rise to the most incredible cruelties the history of labor legislation shows; and it is not now confined to these employments, but pervades all forms of industrial and commercial life. In the management of the modern factory there have been and still exist grave abuses in the form of long hours, child-labor, and unsanitary conditions. But the main question is whether these evils are essential to the system or are incidental abuses which an educated public sentiment and proper legal enactments will abolish. Certainly wrong conditions are more easily detected and removed when concentrated in large factories than when scattered over a multitude of small shops. In the mill, too, the law may be made the champion of the workman in limiting the hours of labor, while at his own home the length of his working day may be measured by the endurance of the worker. Commenting on this phase of the subject in *America's Working People*, Charles B. Spahr says: "I was struck with the sanitary gains which the factory system has brought to the working classes. As compared with the home workrooms which the factories have displaced, conditions seemed almost ideal. It is true that there were rooms in which the air was thick with dust, and others in which it was heavy with odor of chemicals, and many more where the noises would be sufficient to rack the brains of people unaccustomed to them. But the dust, so to speak, was clean dust, and the odors were clean odors, and the din of the machinery was said to act as a sedative rather than an irritant to those who spent their lives in the mills. . . . The dust, the smells, the noises, are all evils, but none of the things to which the human frame must inure itself in factories sap the vitality like the conditions in the tenement-house workshops. The safety, the cleanliness, the light, and even the ventilation in all the factories showed that agitation and legislation, supported by the humanity of employers, as well as by the self-interest of workmen, had raised the sanitary conditions to a higher level in public factories than in the homes of even our modern workmen." Upon one phase of the physical effect of factory life upon the workman Mr. Spahr touches lightly, but if his statements admit of general application, they furnish a strong indictment against the factory system. "When I had gone through room after room, everywhere watching faces, I was forced to remark that I hadn't seen any old men . . . except at long intervals, and then at such work as sweeping and the like. By 'old men' I mean men above forty-five or what should be the prime of life. 'Why do the men drop out so young? I asked. . . . The answer was ready and specific. The strain of the work wore men out before they were forty-five, and their fingers were no longer nimble enough to keep up with the work demanded."

It is also contended that the factory system, in which each operator repeats indefinitely a single task, requires and creates a lower grade of intelligence among workingmen than the old system under which the laborer knew the whole of his trade; that the man who works in the modern shoe factory, feeding an automatic sole-cutting machine or automatic heeler, does not need and will not have the mental vision of the ancient shoemaker. And yet the work of the modern factory operative requires an alertness of intelligence and deftness of movement undreamed of by the ancient handicraftsmen, while the shorter hours, increased wages, and higher standard of living among laborers, that have come with the factory system, give him time for outside interests and self-improvement which his predecessors never enjoyed. The success of the system and the skill of the individual operator alike are dependent upon this minute subdivision of labor. As an example of the extent to which the latter is carried a quotation may be made from Mr. Hubert's article in *Scribner's*, already referred to: "It is stated that a pair of lady's boots can be completed in a modern shoe factory in less than twenty minutes. To accomplish this 57 operators and 42 machines are employed, which require 26 pieces of leather, 14 pieces of cloth, 24 buttons, 80 tacks, 20 nails, 2 box toes, 2 steel shanks, and 20 yards of thread." It must be remembered that this minute subdivision of labor has brought about the gathering together under one roof of an enormous army of men with common aims and interests. The intellectual stimulus which the discussion of common needs, grievances, and plans furnishes should do much toward preserving the mental balance which constant concentration on a single form of work might endanger. All forms of labor organization, most labor legislation, and the labor movement in general are the fruits of the factory system. So also are the enormous capitalistic combinations of the present day. Two economic effects may be safely assigned to the system: The widening of the gulf between capital and labor, on the one hand, and between skilled and unskilled labor on the other. Of what far-reaching industrial and political changes these effects will themselves prove the cause it is not the province of this articles to discuss.

It cannot be denied that the factory system, by the specialization of industries in given localities, thus making each community dependent upon all the rest of the world for everything except the one or few articles locally produced, has enormously quickened commerce and increased the interdependence of nations, and is thus one of the greatest unifying forces of the age. See LABOR; LABOR LEGISLATION; MANUFACTURES.

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FACTORY ACTS. See LABOR LEGISLATION.

FACTORY INSPECTION. The most important part of factory legislation, for it is only by the constant visits of well-trained, intelligent, and efficient inspectors that factories can be prevented from evading and practically nullifying the laws. Such inspectors can strengthen the laws by liberal interpretations of their powers, by advocating better legislation, and by publishing full reports in which the facts are presented in such a way as to impress the general public with the need of reform. Unfortunately, few factory inspectors are as yet trained workers. As a rule their numbers are insufficient to maintain adequate supervision of all factories; many are political appointees; some are conscientious but unintelligent. It is, however, due to the labor of certain inspectors that many improvements have been made in the laws. The first factory act was passed in England in 1802, which was to be enforced by the local justices, who should appoint visitors. In 1833-34 four Government inspectors were appointed, to whom nine inspectors were added in 1842, and sub-inspectors, together with greater powers, in 1844-46. A law of 1867 experimented with the inspection of workshops by means of local authorities, but the centralized system was found superior. The consolidated act of 1878 increased the staff of inspectors, and since 1893 working men and women have been appointed on the force, and the numbers again increased. The department is under the Home Office, with the chief inspector in London, five superintending inspectors in London, Manchester, Glasgow, and Leeds, and 48 assistants. The inspectors render admirable reports, the working men frequently go to them for advice, and the trade unions demand that their number should be increased. The following States have provided for factory inspection: Massachusetts in 1877, and since then New Jersey, New York, Pennsylvania, Delaware, Maine, Rhode Island, Connecticut, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Tennessee, and California. The chief factory inspector is appointed either by the Governor or by the Commissioner of Labor. In a few cases the Commissioner acts in that capacity. In Massachusetts factory inspection belongs to the police department. Delaware, Pennsylvania, and Rhode Island provide that some of the deputy inspectors shall be women. The work of factory inspection consists in seeing that the provisions of the laws are enforced. To enforce sanitary building laws or machinery laws, technical knowledge is often required. In 1886 the International Association of Factory Inspectors, with members from Canada and the United States, was organized to promote uniformity in factory laws. See LABOR LEGISLATION; LABOR PROBLEM; SWEAT-SHOPS.

FACTORY SCHOOLS. See TECHNICAL EDUCATION.

FAC'ULÆ (plur. of Lat. *facula*, small torch). In astronomy, the spots, brighter than the rest of the surface, which are sometimes seen on the sun's disk. See SUN.

FACULATIVE PLANT. A plant endowed with a capacity for growth in more than one life condition; applied especially to plants that may be either parasites or saprophytes, as opposed to obligate plants. See SYMBIOSIS.

FACULTY (Lat. *facultas*, ability, from *facilis*, easy, from *facere*, to do). A term used generally in psychology to denote any sort of mental function. Specifically the name 'faculty psychology' is applied to a psychological school which has its typical representative in Christian Wolff and its most renowned expositor in Immanuel Kant (q.v.). Its mode of procedure is to take the functional terms in common use (feeling, perception, understanding, memory, imagination, etc.), and by logical process to reduce them to some one, two, or three principal faculties, to which the others are then subsumed as subordinate faculties. The mind thus appears as constituted of certain powers or potentialities, which are realized in the individual cases of remembering, thinking, etc. Wolff himself recognizes two principal faculties—knowledge and desire—though he endeavors to unify them in a single supreme faculty of representation. The lower faculty of knowledge includes sense, imagination, the poetic faculty, and memory; the higher includes attention, reflection, and understanding. The lower faculty of desire, again, comprises pleasantness and unpleasantness, sense desires and aversions, and emotion; the higher includes volition, positive and negative, and freedom. Kant adopts a threefold classification of mental phenomena, though he subordinates all the mental powers to the faculty of knowledge ('understanding,' in the wider sense). This comprises (1) understanding in the narrower sense, which is legislative for knowing; (2) reason, which is legislative for the faculty of desire; and (3) judgment, which legislates for feeling. Knowledge is further divided into a lower or receptive faculty of sense, and a higher or active faculty of understanding.

It it clear that a psychology based on these principles of classification can never pass the bounds of superficial description. It makes no effort to analyze mental processes; and the powers or functions which it discriminates have no biological or genetic sanction. Moreover, there is always the danger that a classificatory term, such as 'memory,' shall be raised to the rank of an explanatory principle, substantialized or hypostatized; in which case superficiality is changed to serious error. It does no harm to group together all the facts of remembering and forgetting, under a general class-term 'memory;' such grouping may, indeed, be useful, as serving to bring all the relevant facts before the psychologist's attention. But if we go further, and proceed to account for a given fact of remembering by appeal to the mind's power of memory, we have involved ourselves in a vicious circle. It is one of Herbart's great merits that (1) by insisting on the need of starting psychological investigation from the given facts and not from possibilities which the facts are supposed to realize, and (2) by emphasizing the abstract and purely classificatory nature of the faculty concepts, he removed a powerful and growing abuse, and paved the way for the more rigorous and scientific methods of modern psychology. The service is all the greater, since 'popular' psychology is, in the nature of things, a faculty psychology, and the doctrines of the latter are therefore peculiarly insidious. Consult: Herbart, *Werke*, ed. by von Kehrbach (Leipzig, 1882); Wundt, *Physiologische Psychologie* (Leipzig, 1893); Titchener, *Experimental Psychology* (New York, 1901).

FACULTY (of a university). See University.

FACULTY OF ADVOCATES. See Advocates, Faculty of.

FADETTE, fȧ'dĕt', La Petite (Fr., the little Fadette). An idyllic romance by George Sand (1848), named from its heroine, a precocious child, who is sought by two lovers.

FADÉYEFF, fȧ-dā'yĕf, Rastislav Andreyevitch (1824-84). A Russian soldier and military author. He was educated at the artillery school in Saint Petersburg, and at the age of sixteen entered the army that served in the Caucasus. He subsequently participated in the war in Asiatic Turkey, was present at the siege of Sebastopol, and in 1864 was promoted to the rank of major-general. In consequence of a Panslavistic publication, entitled *The Military Power of Russia* (1868; German trans. by Eckardt, 1870), in which he demanded the annihilation of Austria, and expressed sentiments strongly antagonistic to Germany and favorable to France, he was compelled to resign his commission in 1871. He was subsequently sent on missions to Egypt (1875), and Servia and Montenegro (1877), where he participated in the siege of Antivari. In 1881 General Ignatieff gave him an appointment in the administrative department of the press at Saint Petersburg. His publications in the Russian language, which are widely known, comprise: *Sixty Years of War in the Caucasus* (1860); *Opinion on the Eastern Question* (Engl. transl. by T. Mitchell, 1871; also transl. into German); and *Letters on the Present State of Russia* (1881). His collected works were published at Saint Petersburg in 1890 (2 vols., with a biography).

FADLADEEN, făd'lȧ-dēn'. The self-conceited grand chamberlain of Aurungzeb's harem in Moore's *Lalla Rookh;* a shrewd and infallible authority on everything "from the mixture of a conserve of rose-leaves to the composition of an epic poem." His criticisms on the tales told to Lalla Rookh by the young King in disguise are the cause of an amusing situation when the poet's identity is disclosed.

FAD'LADIN'IDA. The free-mannered wife of King Chrononhotonthologos in Henry Carey's burlesque of that name (1734).

FÆCES, fē'sēz (Lat. *fœx*, dregs). Excrements, the waste material evacuated from the bowels, consisting of undigested food, indigestible parts of food, bile, mucus, and certain other matters taken from the blood by the liver and other glands. In birds, reptiles, and fishes, in the Monotremata order of mammals, and in many lower animals, urine is also mixed with the fæces before they leave the body. The fæces of the horse, cow, and hen are commonly spoken of as manure, and used as a fertilizer. The excrement of wild birds, collected in great quantities on islands where they propagate, is called guano (q.v.). Human excrement, after being prepared by a patented process, is called poudrette, which is also used as a fertilizer. The composition of human fæces is shown in the following table:

	Per cent.
Water	73.3
Organic remains	7.0
Biliary and nitrogenous matter	14.9
Albumen	0.9
Extractives	2.7
Salts	1.2

FAED, fād, John (1819—). A Scottish painter, born at Burley Mill, in the Stewartry of Kirkcudbright, where his father was an engineer and millwright. When hardly entered on his teens, he was in the habit of making tours through the villages of Galloway, painting miniatures. In 1841 he came to Edinburgh, where he found much appreciation. Both he and his brother Thomas continued the work of David Wilkie (q.v.), painting the interesting genre subjects so pleasing to the general public, because they are poetic and literary rather than artistic. He became a member of the Scottish Academy in 1851. Among his chief works are: "The Cruel Sisters" (1851), "Shakespeare and His Contemporaries," "The Cotter's Saturday Night" (1854), "Catherine Seyton" (1864), "The Soldier's Return," "The Old Style," "Tam o' Shanter," "Haddon Hall of Old," "The Stirrup Cup" (1867), "John Anderson, My Jo" (1869), "The Gamekeeper's Daughter," and "The Hiring Fair." In 1849 he removed to London, where he resided till 1880, when he retired to Gatehouse, Scotland, where he now lives. His most recent pictures have been landscapes.

FAED, Thomas (1826-1900). A Scottish genre and historical painter. He was born at Burley Mill, and was a brother of John Faed, from whom he derived his first instruction. He also studied under Sir William Allen and Thomas Duncan at the Edinburgh Academy. In 1849 he became an associate of the Royal Scottish Academy, and shortly after executed a very attractive work entitled "Scott and His Friends at Abbotsford." In 1852 he removed to London, where his "Mitherless Bairn" was exhibited in 1855. Among his subsequent works are: "Home and the Homeless" (1856), "The First Break in the Family" (1857), "Sunday in the Backwoods" (1859), "From Dawn to Sunset" (1861), "Baith Faither and Mither" (1864), "The Last o' the Clan" (1865), "Ere Care Begins" (1866), "A Wee Bit Fractious" (1871), "Forgiven" (1876), etc. Faed was made A.R.A. in 1859, R.A. in 1864, and elected an honorary member of the Vienna Royal Academy in 1875. Owing to the failure of his eyesight, he ceased work in 1892. He died in London, August 17, 1900. His paintings, like his brother's, are interesting rather for their subjects, sentimental or pathetic incidents in humble Scotch life, than as works of art. They are very popular and have been much reproduced in engraving.

FAENZA, fä-ĕn′zȧ (Lat. *Faventia*, from *favere*, to favor). A city in North Italy, on the Lamone (ancient Anemo), 31 miles southwest of Bologna (Map: Italy, F 3). From Faenza comes the word faïence, for the manufacture of which the city was famous in the fifteenth century. On Vittorio Emanuele square, where the four main streets meet, are the city hall, which was once a palace of the Manfredi, the beautiful Church of San Michele, the modern theatre, and the Cathedral of San Costanzo, who was the first Bishop of Faenza. The square is surroundered by arcades, and has a seventeenth-century fountain in the centre. The cathedral is a basilica, begun in 1474, containing many works of art, among them a Holy Family by Innocenzo da Imola, and the tomb of Saint Savinus by Benedetto da Majano (1472). In the municipal Pinacoteca are paintings by artists of the Romagna. The city has a library, a gymnasium, a technical school, a lyceum, and a school of design. The most important industries are the manufacture of majolica, the spinning and weaving of silk, and sulphur refining. An important trade in wine, silk, and hemp is carried on. In B.C. 82 Faventia was the scene of a victory of Sulla over Carbo, and in A.D. 542 Totila here defeated the Byzantines. Later it became a part of the Exarchate, was captured in 1241 after an eight months' siege by Frederick II., and in 1313 came into the possession of the Manfredi. In 1509 Julius II. united it to the Papal States. Population of commune, in 1901, 40,370.

FAERIE (fā′ĕr-ĭ) **QUEENE,** The. An allegorical romance of chivalry, by Edmund Spenser. Of the twelve books contemplated six were published (1590 and 1596), but only fragments of later books appeared. Each book is divided into twelve cantos, telling the legend of a knight who represents one of the chief virtues—Holiness, Temperance, Chastity, Friendship, Justice, Courtesy. Of another book, on Constancy, only a fragment is extant.

FAFNIR, fäf′nêr (Icel., Embracer). In Norse mythology, the son of the giant Hreidmar. In the shape of a dragon he guarded the treasure later known as the *Nibelungenhord*, and was killed by Sigurd.

FAG. The mendacious servant of Captain Absolute in Sheridan's comedy *The Rivals*, who is always ready to lie at his master's word.

FAGEL, fä′kĕl, Frans Nicolaas, Baron (1645-1718). A Dutch general, a nephew of Kaspar Fagel, born at Nimeguen. He distinguished himself at Fleurus (1690), and commanded at the defense of Mons (1691) and at the siege of Namur (1695). As lieutenant-general he led the army at the siege of Bonn (1703), and fought at Eckeren (June 30, 1703). Subsequently transferred to the Portuguese army, he stormed Valencia (1705) and Albuquerque, and besieged Badajoz. Upon his return to Holland he fought at Tournai, Ramillies, and Malplaquet, besieged Béthune, forced the passage of the Scheldt (1712), and captured Le Quesnoy.

FAGEL, Kaspar (1629-88). A Dutch statesman, born at Haarlem. In 1670 he became secretary of the States-General, and in 1672 was appointed grand pensionary to succeed De Witt. He believed in the ability of William of Orange to redeem Holland from its perilous position, and attached himself to the fortunes of that prince. It was by his suggestion that the hereditary stadtholdership was in 1674 conferred upon William. It was he, also, who prepared the way for the accession of William to the throne of England as the champion of the Protestant cause. At the same time he raised the courage of his compatriots and presented an indomitable opposition to the projected peace with Louis XIV.

FAGEL, Hendrik, Baron (1765-1834). A Dutch statesman. He studied at Leyden, and in 1787 was appointed second secretary of the States-General. He soon afterwards succeeded his grandfather as secretary, being the sixth member of the family to occupy that position since 1672. In 1794 he was appointed, in association with Van de Spiegel, to conclude an alliance with Prussia and England, to which latter country he was sent as Ambassador in 1813. He subsequently signed the treaty of peace between England and Holland.

FAGERLIN, fä′gĕr-lēn, Ferdinand Julius (1825—). A Swedish painter, born at Stockholm. Originally a shipbuilder, he was later for a time in the military service, but, after some amateur work, especially in portraiture, from 1854 adopted art as his profession. After study at the Academy of Stockholm, at that of Düsseldorf, and under Couture in Paris, he settled in Düsseldorf, where he was appointed to a professorship in the Academy in 1893. His most important work is done in genre. In particular, his characterizations of Dutch fisher life have ranked him among the principal Swedish artists. His canvases of this sort are generally faithful in detail, touched by a quiet humor, and admirably colored. They include: "Jealousy" (1868); "Without Hope" (1876); "The Deserter" (1883); and "The Return from the Shore" (1886).

FAGGING. A term of uncertain origin in the public schools of England. The services of a fag are of two kinds—the one comprising his duties to a special upper-form boy, to whom he has been assigned; the other consisting of those due to the whole of the upper boys. The former comprise such tasks as preparing his master's breakfast, making his master's fire, carrying his master's messages, and smuggling into the house little forbidden delicacies for his master's consumption, and in this instance, if detected, bearing his master's punishment. Those services which a lower boy owes to the whole of the upper boys are summed up in attendance at the games. In the cricket season, fags stand behind the wickets to stop the balls while their seniors are practicing; and at all seasons they are liable to the task of waiting attendance on the racket-players, and retrieving the balls which have been 'skyed' out of the court. No boy, however, is liable to an imposition really menial. All cases of difficulty arising out of fagging are within the jurisdiction of the head boy in the house, or the head of the school, and are settled by reference to the one or the other. Consult Hughes, *Tom Brown's School Days* (Cambridge, 1857).

FAGGOT-WORM. A Ceylonese bagworm (*Eumeta Carmerii*), whose pupa-case resembles a bundle of small faggots. It occurs on the coffee-bushes, and the natives say that they represent the souls of dead men and women, who in life were persistent thieves of firewood, and are thus punished.

FAGIN, fā'gĭn. The Jew in Dickens's *Oliver Twist*, a receiver of stolen goods, who trains up a gang of thieves and pickpockets. He abducts Oliver Twist, and is finally condemned to death for murder.

FA'GIUS (Latinization of his German name *Büchlein*), Paul (1504-49). A German divine and Hebraic scholar. He was born at Rheinzabern in the Palatinate. After completing his academic studies at Heidelberg, he removed to Strassburg, where he was a pupil of Wolfgang Capito, the famous Hebraist. In 1537 he became pastor at Isne, where also he received instruction in Hebrew from the rabbi, Elias Levita, whom he had induced to come from Venice to assist him in his studies. He established a Hebrew printing-press, and published many works of interest to Oriental scholars. His reputation as a Hebraist in 1542 secured for him invitations to the chair of Hebrew at Strassburg, Constance, and Marburg, and after holding professorships in these cities he went to Heidelberg in 1546 to aid the party of the Reformation in the university. After his deposition in 1549 because of his refusal to obey the Interim, he was invited by Archbishop Cranmer to come to England, where he died soon after his arrival at Cambridge. He published D. Kimchi's *Commentary to the First Ten Psalms* (1543); editions of the *Sayings of the Fathers* and of the books *Sirach* and *Tobias*, together with a Latin commentary (1541-42); a Latin translation and exegesis of the *Targum* of Onkelos (1546); an exegetic work on the first four chapters of *Genesis* (1542); a *Hebrew Grammar* (1543); and an elementary text-book for the use of his pupils.

FAGNANI, fȧ-nyä'nē, Joseph (1819-73). An Italian painter. He was born in Naples, Italy; studied in Vienna and Paris, and came to the United States with Sir Henry Bulwer in 1849. He made portraits of a large number of public characters, among them Victor Emmanuel, Abdul Aziz, Garibaldi, the Empress Eugénie, and Ali Pasha, and painted a series of portraits of the most beautiful women of New York, called "The Nine Muses," which are now in the Metropolitan Museum of Art, New York. His work was popular in his day, but is of mediocre quality and has no enduring value.

FAGOTIN, fȧ'gō'tăɴ'. A monkey, famous in Paris for his cleverness in the days of Molière, and frequently mentioned in the literature of that time.

FAGUET, fā'gȧ', Emile (1847—). A French critic, journalist, and literary historian. His *La tragédie française au XVI. siècle* (1883) is the best treatise on the subject; his *Etudes littéraires* on the sixteenth, seventeenth, eighteenth, and nineteenth centuries, and his *Politiques et moralistes du XIX. siècle* (1891-1901), contain learned yet popular essays of great value, and his dramatic criticisms contributed to *Le Soleil* and collected in an extending series, *Le théâtre contemporain* (1880), are brilliant. He is editor of a series of *Classiques populaires*, and author of a popular literary history, *La littérature française* (1901), and of *Problèmes poétiques du temps présent* (1901). He was chosen member of the French Academy in 1901.

FA'GUS. See Beech.

FAHA'KA. A globefish (*Tetraodon fahaka*) of the Nile delta.

FA HIEN, fä hē-ĕn'. A Chinese Buddhist monk and traveler. He was a native of Chang-au, in the Province of Shen-si. During the years A.D. 399-414 he traveled extensively in India, Khotan (Yu-than), and Tibet in company with Hui King and other Chinese pilgrims. From Khotan he journeyed through Kashmir, Kabul, Kandahar, and the Punjab, to Central India, which he reached in A.D. 405, after six years of wandering. He remained in India for six years, and then went to Ceylon, from there to Java, and he arrived at his home in China once more in A.D. 415. After his return he wrote an account of his travels, called *Fō-kue-ki*, or story of the Buddhist countries. This journal is concise, and chiefly taken up with a description of the sacred spots and objects of the Buddhist faith, which was at that time the dominant religion in India. The narrative has been translated into French by Rémusat (Paris, 1836); and into English by Beal (London, 2d ed. 1884), Giles (Shanghai, 1877), and Legge (Oxford, 1886).

FAHLCRANTZ, fäl'krȧnts, Christian Erik (1790-1866). A Swedish poet and theologian, born at Stora Tuna (Province of Dalarna). He wrote several long poems and some controversial works. From 1839 to 1852 he published, with the collaboration of Knös and Almqvist, an *Ecclesiastical Journal*. In 1849 he was made Bishop of Westerås. His most important work is *Noach's Ark* (1825-26), a humorous and satirical poem. Besides this may be mentioned *Ansgarius* (1835-46). The collected works of Fahlcrantz have been published under the title *C. E. Fahlcrantz: Samlade Skrifter* (Oerebro, 1863-66).

FAHLCRANTZ, Karl Johan (1774-1861). A Swedish landscape painter, brother of the preceding, born at Stora Tuna. He was a pupil of P. Ljienz, and studied much directly from northern scenery, which he depicted with great effect. His manner was spacious, devoted rather to general impressions than to a faithful rendering of detail. Among his paintings are "The Legend of Fritjof," and "Donare Waterfall."

FÄHLMANN, fāl'mȧn, Friedrich Robert (1800-50). A Russian philologist. He was born in Esthonia, and studied medicine and philology at Dorpat, where in 1842 he became lecturer on the

Esthonian language. He collected and edited the material constituting the *Kaleviade* or *Kalevipoeg* ("The Son of Kalev"), which was published after the death of Fählmann by Kreutzwald (1857-61).

FAHNE, fä′ne, ANTON (1805-83). A German jurist and historian. He was born at Münster, and was educated at Bonn and Berlin. He wrote many special histories of bishoprics, cities, and noble families which contributed valuable details to the history of Westphalia and the Rhine District. These works include: *Forschungen aus dem Gebiet der rheinischen und westfälischen Geschichte* (1864-75); *Denkmale und Ahnentafeln in Rheinland und Westfalen* (1879-83); and the interesting book on Livonia, entitled *Livland. Ein Beitrag zur Kirchen- und Sittengeschichte* (1875).

FAHRENHEIT, fä′ren-hīt, GABRIEL DANIEL (1686-1736). A German physicist, who made several important improvements in the thermometer. He was born in Danzig. His inclination for scientific research induced him to give up mercantile pursuits, and, having traveled through Germany and England, he settled in Holland, becoming a manufacturer of meteorological instruments. In 1720 he first conceived the idea of using mercury instead of alcohol in the construction of themometers, by means of which the accuracy of the instrument was very much improved. He also devised the scale of graduating the thermometers known by his name, and discovered that other liquids besides water had a fixed boiling-point, and that the boiling-point varied with a change in the pressure of the atmosphere. (See THERMOMETER.) In 1724 Fahrenheit was elected a fellow of the Royal Society of London, and the *Philosophical Transactions* of that year contain several papers by him on physical subjects.

FAIDER, fȧ′dẽr, CHARLES JEAN BAPTISTE FLORENT (1811-93). A Belgian jurist and statesman, born at Triest. He was admitted to the bar in 1832, in 1844 became Advocate-General in Brussels, and in 1851 Advocate-General in the Court of Cassation. From 1852 to 1855 he was Minister of Justice. He published an *Histoire des institutions politiques de la Belgique* (1874), and other valuable works.

FAIDHERBE, fȧ′dârb′, LOUIS LÉON CÉSAR (1818-89). A French soldier. He began his military career in Algeria in 1844; was a captain in Guadeloupe in 1848 and in Algeria in 1851-52; and in 1854 was made Governor-General of the French possessions in Senegal, where he reorganized the Government and extended the French territory. To do this he was compelled to wage a war of extermination against the Prophet El-Hadji Omar, who had formed the project of driving out all foreigners and founding an immense Mohammedan empire in Central Africa. A satisfactory treaty was made with Omar in 1863. In the war with Germany, Faidherbe was intrusted by Gambetta with the command of the Army of the North, but was defeated by von Goeben at Bapaume and at Saint Quentin. In 1871 he was a member of the National Assembly. He was the author of valuable works on the geography, anthropology, and philology of Senegal and Algeria. Among them may be mentioned *Instructions sur l'anthropologie de l'Algérie* (1874). Consult Brunel, *Le Général Faidherbe* (Paris, 1890).

FAÏENCE, fȧ′äNs′ (Fr. from It. *faenza*, faïence, for *porcellana di Faenza*, earthenware of Faenza, a city of Italy, where the ware is said to have been invented). Properly an earthenware of coarse fabric, covered with an opaque enamel upon which decoration may be applied in vitrifiable paint, and fired. The process of manufacture includes three wholly distinct operations, the molding and firing of the original clay, often not more delicate than a cheap flower-pot; the covering with enamel, which is often done by mere dipping, and the firing of this; and finally the decoration, which is often of the greatest refinement in the way of delicate flower patterns and even figure subjects. It appears, then, that the famous majolica (q.v.) is a variety of faïence in the English sense; while stoneware, long known as *faïence Henri Deux* and later as *faïence Saint Porchaire* (q.v.), is not properly faïence in the English sense; while stoneware, porcelain, and all wares that are not covered all over with a thick enamel, including those decorated with slip, and all the varieties of Greek vases and Japanese hard, yellow pottery with crackled glaze, are excluded from this branch of ceramic ware. On the other hand, tiles and bricks, of which the surface is intended to be shown as covered with an opaque material upon which alone the painting is applied, as in the monuments of the early Persian kingdoms, in many of those of Egypt, and in the splendid tiles which sheathe and line the walls of mosques in Cairo and Damascus, are faïence in the strictest sense. The wares to which the term is most commonly applied in the language of students of pottery are the French pieces of the sixteenth, seventeenth, and eighteenth centuries. These are especially the manufacture of Rouen, which as early as 1520 was turning out tiles of great beauty, including frequently painting in figure subjects and in those curiously emblematic compositions which were the delight of designers of that time. These wares were sometimes plain white and blue, and are then of extreme beauty, not closely copied from Chinese originals, like the delft pieces which are named below, but designed with great freshness and novelty in the spirit of the French Renaissance, but bold and graceful. At a later time deep red was introduced, so that the three colors, red, blue, and white, were somewhat easily balanced in the composition, which was in a few cases relieved by gold. These pieces were made for table use even in the wealthiest families, and during the wars of Louis XIV.'s reign, when it became fashionable to send silverware to the mint, splendid services were made for the royal establishment at Versailles and for the nobles of the Court. The exclusive taste for this ware disappeared at the time of the discovery of what is called soft porcelain at the close of the eighteenth century; but the factories flourished down to the end of the eighteenth century, and left their traces in the peasant potteries of the Cevennes and the south. In the mountain regions of Italy very interesting faïence is still made by village potters on good old lines of decoration.

One of these famous wares is that of Nevers, which is marked by a much freer use of landscape designs than that of Rouen, and, when the composition is not actually pictorial, by a much less restricted and carefully designed style of ornamentation, as if copied from the most elaborate designs for brocade. The factory seems to have been established about 1550, and it flourished as late as that of Rouen, though it was never equally extensive. The vases and dishes of Moustiers are famous for their exquisite decoration in conventional flowers arranged in scrolls and festoons, these last being the especial mark of the richer pieces. There are also splendid pieces with coats of arms and a conventional decoration of great solidity and dignity, reminding the student of the finest ware of Rouen. The first manufactory was established at Moustiers-Sainte-Marie in Provence about 1640. There are famous wares which were made in Alsace, at Strassburg, and Niederweiler, and also at Marseilles, where realistic flowers of large size were painted on plates and dishes in a most effective way. Lunéville and Saint-Clément in Lorraine, Rennes in Brittany, Lille, and Valenciennes in the extreme north of France, Lyons, and, in the neighborhood of Paris, Sceaux, Sèvres, Montereau, and many other places, were famous throughout this epoch.

At the same time the factories of Delft in Holland were producing wares of great technical merit, even very large pieces finely modeled and enameled and painted with great care and decorated in two or three different styles. There were the pieces which were closely copied from blue and white Chinese porcelain, the resemblance being never complete, because of the different effect of the white background, and also of the blue painting from that of the Chinese ware, but having a special attractive appearance of its own. There were landscapes often of large size and painted on plaques, square and oblong, of considerable size, often let into chimney-pieces above the fireplace and the like, and also scenes of domestic life, real genre painting, but usually confined to pure blue and white; and similar subjects were painted on small tiles, four or six inches square, many tiles being included in one design. Finally, there are the imitations of the splendid wares of Rouen and other French manufactories, in which case several colors are used. The ware was exported in such immense quantities as to give the name Delf to any faïence used in England, and a similar name, spelled Delphes, or in some such way, in France.

Faïence, in the strict sense, was less common in the nineteenth century, because much tougher wares were made. The beautiful dishes of Delft and Rouen break very easily and are too soft to be repaired in a lasting way. In France, however, many beautiful wares of this kind were made for table use. A breakfast set in faïence, with delicate white glaze of peculiar softness, and painted with realistic flower pattern, would cost only half as much as a porcelain set, no more attractive to the eye, but harder, and, on the whole, more agreeable in use, as well as more enduring. In Italy several factories produce modern imitations of ancient majolica and other pieces designed more or less in close agreement with ancient work; and these are genuine faïence. Most generally, however, the choicer modern wares, whether for use or adornment, are of some variety of stoneware, of 'ironstone china', of terra-cotta, or of porcelain. See MAJOLICA; PORCELAIN; POTTERY.

Consult: Garnier, *Dictionnaire de la céramique* (Paris, n.d.); Ris-Paquot, *Manuel du collectionneur des faïences anciennes* (Paris, 1877); Deck, *La faïence*, a volume of the *Bibliothèque de l'enseignement des beaux-arts* (Paris, 1887), by a practical workman of merit. See also the bibliographies of the articles just referred to.

FAILLON, fȧ'yôɴ', MICHEL ETIENNE (1799-1870). A French missionary and author, born at Tarascon, France. He became a Sulpician monk in Paris, and in 1854 went to Canada on a tour of inspection of the various houses of that Order in America. His contributions to Canadian religious biography embrace lives of *Margaret Bourgeoys*, founder of the Congregation Sisters (1852); *Madame d'Youville*, founder of the Grey Sisters (1852); *Mademoiselle Maur*, founder of the Hôtel Dieu (1854); *Mademoiselle le Ber*, the recluse (1860); and an extended history of the French in Canada, of which three volumes (1865-66) were completed.

FAILLY, fȧ'yē', PIERRE LOUIS CHARLES ACHILLE DE (1810-92). A French soldier. He was born at Rozoy-sur-Serre, was educated at the military school at Saint Cyr, and joined the army in Algeria. At the outbreak of the Crimean War he was made a brigadier-general. He commanded a division in the Italian campaign in 1859, distinguishing himself in the battle of Solferino. In 1867 he was sent at the head of a corps to aid the Pope in his struggle with Garibaldi, whom he met and defeated at Mentana on November 4th. At the beginning of the Franco-Prussian War Napoleon placed him in command of the Fifth Army Corps, where his incompetency became manifest. On August 30th, while commanding the right wing of MacMahon's army at Beaumont, he allowed himself to be surprised and was forced to retreat, thus leaving MacMahon's flank unprotected, and cutting off his retreat—a circumstance which undoubtedly made the capitulation after the battle of Sedan the only alternative. Failly was relieved of his command on the morning of the battle, being succeeded by General Wimpffen. After the war he lived in retirement until his death. He published a defense of his military operations before Sedan, under the title of *Campagne de 1870: Opérations et marches du 5ème Corps jusqu'au 31 août* (1874).

FAILS'WORTH. A town of Lancashire, England, on the Lancashire and Yorkshire Railway, four miles northeast of Manchester (Map: England, D 3). It has extensive cotton-manufacturing industries. The town has an electric-light plant, an overhead trolley system, and maintains modern sewage-disposal works and a cemetery. Population, in 1901, 14,200.

FAILURE OF DAMS. See DAMS.

FAIN, făɴ, AGATHON JEAN FRÉDÉRIC, Baron (1778-1837). Chief private secretary to Napoleon I. He was born in Paris. After having served under the Directory, he was in 1806 appointed Secretary of the Imperial Archives, and in 1813 became Private Secretary to the Emperor, whom he accompanied on all his tours until 1815, when he drew up the papers in which Napoleon definitely abdicated the throne of France. In 1830 he became First Secretary of the Cabinet under Louis Philippe, and was several times intrusted with the administration of the

Civil List. He was Deputy from Montargis until 1834. He wrote some readable and accurate memoirs, dealing chiefly with the later years of the reign of Bonaparte, such as *Le manuscrit de 1814, contenant l'histoire des six derniers mois du règne de Napoléon* (1823-25); *Le manuscrit de 1813* (1824-25), containing the history of the principal events of that year, designed to serve as a basis for a history of Napoleon; *Le manuscrit de 1812* (1827); and *Le manuscrit de l'an III.* (1828).

FAIN'ALL. A rascally character in Congreve's comedy *The Way of the World,* who marries a wealthy widow, but fails in his attempt to get possession of her property.

FAINÉANT, fâ'nâ'äN', Le Noir (Fr., the black sluggard). A name given in Scott's *Ivanhoe* to Richard Cœur de Lion, disguised as the Black Knight, because of the indifference he displayed at a tournament, in which he was nevertheless the victor.

FAINÉANTS (Fr., do-nothings). A designation especially applied to the later Merovingian sovereigns of France, in whose name the mayors of the palace really governed the country. See Merovingians; Carolingians.

FAINTING (from OF. *faint, feint,* p.p. of *feindre,* to feign, from Lat. *fingere,* to fashion), or Syncope. Loss of consciousness, of sensation, and of power of motion, with pallor of the face, temporary cessation of respiration, and temporary feebleness of the heart, with loss of pulsation at the wrist. It is caused by anæmia of the brain, due to temporary heart failure from shock, great weakness or exhaustion, loss of blood, or disease of the heart. Sudden emotion, as fright, excessive joy or grief, may cause fainting in a neurasthenic person. In all cases of fainting the clothing which may impede breathing should be loosened, and the patient should be placed on the back, with the head and chest lower than the abdomen and legs. In a protracted faint a hypodermic of whisky or ether may be necessary. In heart disease and in severe injuries the patient may die without regaining consciousness. See Heart, Diseases of the.

FAIN'WELL, or **FEIGNWELL,** Colonel. A character in Mrs. Centlivre's comedy *A Bold Stroke for a Wife.* After many expedients he succeeds in securing the hand of the heiress, Ann Lovely, by impersonating Simon Pure, whom the lady's guardian had selected as her husband.

FAIR (OF. *feire, foire,* Fr. *foire,* It. *fiera,* fair, from Lat. *feria,* holiday; connected with Lat. *festus,* feast). A meeting held for the purpose of exhibiting or selling goods. Originally fairs were held at stated times and places, some for the sale of a particular class of merchandise, others for the sale of goods of a general character. People resorted to them to exchange goods, and to collect their stores to last for several months. Princes and the magistrates of cities encouraged them, and some of the privileges granted still remain in places. With the crowding together of people in large cities and the rise in rent, the collection of a store of goods to last longer than a few days became impossible, so the original function of the fair ceased to exist. They flourish mostly to-day on the outskirts of civilization, where the means of communication are defective. In Europe they appear to have originated in the Church festivals, which were found to afford the best opportunity for commercial transactions, the concourse of people being such as took place upon no other occasions. In western Europe the goods exposed for sale are chiefly those of which there is a frequent change of fashion. Provisions are seldom an article of sale in them; and while in some parts of the Continent persons of all ranks still wait for the great yearly fairs to make their principal purchases of articles of every description, such as corn, wine, spirits, tea, coffee, etc., these articles are seldom seen in them.

One of the most noted of English fairs was that of Saint Bartholomew, Smithfield, London, founded at the beginning of the twelfth century. They grew in importance in the twelfth and thirteenth centuries, but declined in the fifteenth century, and at the close of the reign of Queen Elizabeth they had degenerated into resorts for pleasure-seekers. The Bartholomew, Greenwich, Glasgow, and Donnybrook fairs are examples of these.

The greatest fairs in Germany are those of Leipzig, Frankfort-on-the-Main, Frankfort-on-the-Oder, and Brunswick. At the first named meetings are held three times a year—New Year's, Easter, and on the Feast of Saint Michael—and it is estimated that $50,000,000 worth of goods are sold. Other noted European fairs are those of Zurzach, in Switzerland; Budapest, in Hungary; Sinigaglia and Teramo, in Italy; Beaucaire and Lyons, in France; and Nizhni-Novgorod, in Russia. The last-named, beginning in July and lasting eight weeks, is frequented by buyers and sellers from all parts of Europe and northern and central Asia, and it is said that merchandise to the value of over $100,000,000 is sold. Outside of Europe, the most important fairs are those of Tanta, in Upper Egypt; Kiakhta and Irbit, in Siberia; Hurdwar, in India; and Mecca, in Arabia. The last-named fair is held at the time of the annual pilgrimage, and over 100,000 people visit it.

In the United States there are no fairs of the kind that have been common in the Old World; but the term is applied to a variety of exhibitions, such as church, charity, and agricultural fairs, and local, State, national, or international expositions or fairs. In fact, the term is applied to all exhibitions where people are expected to bestow patronage or to make purchases. At church or charity fairs articles, chiefly of the fancy sort, are sold. The most common kind are the agricultural fairs, county and State. Elkanah Watson, a prosperous merchant of Albany, N. Y., was the originator of these. Mainly through his influence the New York Legislature appropriated, in 1819, $10,000 a year for six years, for premiums on agricultural products and family manufactures. Since then annual State fairs have become quite general, and many States appropriate funds to aid them. The most common fairs are the annual county fairs, where live stock and all kinds of vegetable products and manufactured goods are exhibited, and premiums are awarded to the possessors of the best grades. These fairs are not held primarily for the purpose of selling commodities at the fair, but largely for advertising purposes. The city street fairs, where amusements of various kinds are furnished, are intended to promote the welfare of the city by attracting traders to them.

The world's fairs or expositions, and the international or State fairs, which have become famous within the last half-century, are chiefly educational in character, and are adapted to the commercial life of the present, with its rapid means of communication, its populous cities, and production on a large scale, as the old fair, with its convenient meeting-ground for buyers and sellers, was adapted to the commercial life of a few centuries ago. These fairs are intended to promote the interests of the city and nation or State in which they are held, and to furnish an excellent opportunity for the advertisement of all classes of goods. While commodities are sold at these fairs, the primary purpose of them is to advertise.

FAIR, JAMES GRAHAM (1831-94). An American capitalist, born near Belfast, Ireland. He came to the United States in 1843, and went to California on the breaking out of the gold fever in 1849. After 1860 he was engaged in the mining of gold and silver in Nevada, and amassed great wealth. In 1867 he entered into partnership with J. C. Flood, W. T. O'Brien, and J. W. Mackay in several large mining projects. He was elected as a Democrat to the United States Senate in 1881, and served one term.

FAIR'BAIRN, ANDREW MARTIN (1838—). Principal of Mansfield College, Oxford. He was born near Edinburgh, and was educated at Edinburgh, Glasgow, and Berlin universities. He commenced his ministry in 1861, at Bathgate; removed to Aberdeen, 1872; became principal of Airedale College, Bradford, England, 1878, lecturing at Edinburgh, 1881-83, on the "Comparative History of Religions." In 1883 he was selected as chairman of the Congregational Union of England and Wales, and in 1886 removed to Oxford, to become the principal of Mansfield College. He has made several lecturing visits to the United States, and published, among other books: *Studies in the Philosophy of Religion and History* (London, 1876); *Studies in the Life of Christ* (1880; 5th ed. 1885); *The City of God* (1883; 2d ed. 1885); *Religion in History and in the Life of To-day* (1884; 3d ed. 1894); *The Place of Christ in Modern Theology* (1893; 7th ed. 1896); *Catholicism, Roman and Anglican* (1899; 2d ed. same year); *The Philosophy of the Christian Religion* (1902).

FAIRBAIRN, PATRICK (1805-74). A clergyman of the Free Church of Scotland, born at Hallyburton, Berwickshire. He was educated at Edinburgh, and licensed to preach, 1826. When the disruption occurred (1843) he joined the Free Church. He became professor of divinity in the Free Church College in Aberdeen (1853), was transferred to the similar institution in Glasgow (1856), and made principal the same year. His reputation rests upon his *Typology of Scripture* (1845-47; 6th ed. 1880); *Prophecy* (1856; 2d ed. 1866); *Hermeneutical Manual* (1858); and *Pastoral Theology* (1875), with sketch of his life by J. Dodds.

FAIR'BAIRN, Sir WILLIAM (1789-1874). An English engineer, born at Kelsò, in Roxburghshire, February 19, 1789. He learned a little reading, writing, and arithmetic at the parish school of Mullochy, in Ross-shire, and after some six months' instruction from an uncle, he was apprenticed to a machinist at Percymain Colliery, North Shields. When his apprenticeship terminated, Fairbairn worked for two years in London, and then visited many places in England, Wales, and Ireland, working a short time at each, in order to observe the various practices of different localities. Eventually he commenced business on his own account in Manchester in 1817. The first great improvement introduced by Fairbairn was the substitution of iron for wood in the shafting of cotton-mills, and the substitution of light for heavy shafting where metal was already in use. This exchange economized the cost of machinery, and enabled the shafting to be speeded from 40 to 160 revolutions per minute. Fairbairn was among the earliest of the iron-ship builders, and originated various improvements in ship construction.

The first idea of a tubular bridge across the Menai Strait is due to Robert Stephenson, but its realization is largely due to Fairbairn, and he erected more than a hundred bridges upon this principle. He was president of the British Association for the Advancement of Science, 1861-62; and was created a baronet in 1869. His son THOMAS was chairman of the art treasures exhibition at Manchester, 1857; was a commissioner for the exhibitions of 1851 and 1862; was high sheriff of Hampshire, 1870, and was in 1857 offered the honor of knighthood, which he declined. Fairbairn, among other works and papers, published: *On Canal Steam Navigation; The Strength and Other Properties of Hot and Cold Blast Iron; The Strength of Iron at Different Temperatures; The Strength of Locomotive Boilers; The Effect of Repeated Meltings on the Strength of Cast Iron; The Irons of Great Britain; The Conway and Britannia Tubular Bridges; Useful Information for Engineers*, 1st, 2d, and 3d series; and *A Treatise on Mills and Mill Work*. He died at Moor Park, Surrey, August 18, 1874. Consult: Pole, *Life of Sir William Fairbairn, Bart.* (London, 1877); and Smiles, *Lives of the Engineers* (London, 1874).

FAIR'BANKS, ARTHUR (1864—). An American teacher and author. He was born at Hanover, N. H. After graduating at Dartmouth College, in 1886, he studied at Union Theological Seminary and the Yale Divinity School, and received the degree of Ph.D. from Freiburg in 1890. He taught at Dartmouth, Yale, and Cornell, and in 1900 became professor of Greek literature and archæology in the State University of Iowa. His publications include an *Introduction to Sociology* (3d ed. 1901; Japanese trans., 1900).

FAIRBANKS, CHARLES WARREN (1852—). An American lawyer and politician, born near Unionville Centre, Ohio. He graduated at the Ohio Wesleyan University (Delaware, Ohio) in 1872, was admitted to the Ohio bar in 1874, in 1892 was chairman of the Republican State Convention. In 1897 he was elected to the United States Senate, and in 1898 was appointed a member of the British-American Joint High Commission, and chairman of the American commissioners.

FAIRBANKS, HENRY (1830—). An American clergyman and inventor, born at Saint Johnsbury, Caledonia County, Vt., the only son of Thaddeus Fairbanks. He graduated at Dartmouth College in 1853, and studied at Andover Theological Seminary. After his ordination in 1858, he entered the service of the Vermont Missionary

Society. He became professor of natural philosophy at Dartmouth College in 1859, and continued in the position until 1868. In 1869 he received a patent for a scale for weighing grain, and subsequently perfected and patented thirty-four additional inventions of various kinds. He was the first president, under the new constitution, of the Convention of Congregational Ministers and Churches in Vermont, and afterwards became president of the Vermont Domestic Missionary Society.

FAIRBANKS, Thaddeus (1796-1886). An American manufacturer and inventor, born at Brimfield, Mass. In 1824 he entered into partnership with his brother Erastus, under the style of Erastus and Thaddeus Fairbanks, in the manufacture of stoves and plows, the patterns for which were planned and made by Thaddeus. He patented a cast-iron plow in 1826, and in 1831 a hemp-dresser. Foreseeing the difficulty of weighing the hemp-straw, the only scale then in use being the even balance and the Roman steelyard, he constructed a platform scale on which an entire load could be weighed at one time. Thenceforth the brothers devoted themselves exclusively to the manufacture of scales in great variety, from the most delicate instruments for the use of chemists and jewelers to those for railroad tracks and canal weighlocks. Mr. Fairbanks planned and constructed his own shops and invented the machinery employed in them. He received the grant for his last patent on his ninetieth birthday. He founded and liberally supported Saint Johnsbury Academy, his contributions to that institution having aggregated about $200,000.

FAIR'BURY. A city and the county-seat of Jefferson County, Neb., 57 miles south by west of Lincoln; on the Little Blue River, and on the Chicago, Rock Island and Pacific, and other railroads (Map: Nebraska, G 3). Its has good water-power, and various manufactures and an extensive nursery. Population, in 1890, 2630; in 1900, 3140.

FAIR'CHILD, Charles Stebbins (1842—). An American lawyer and financier, born at Cazenovia, N. Y. He graduated at Harvard in 1863 and was admitted to the bar in 1866. He was Attorney-General of New York from 1876 to 1878, from 1885 to 1887 was Assistant Secretary of the Treasury, and from 1887 to 1889 was Secretary of the Treasury in Cleveland's first Cabinet, succeeding Daniel Manning. He was a member of the Monetary Commission appointed by the Indianapolis Monetary Conference in 1897.

FAIRCHILD, George Thompson (1838—). An American agricultural scientist and educator. He was born at Brownhelm, Lorain County, Ohio; graduated in 1862 at Oberlin College (Ohio), and in 1865 at Oberlin Theological Seminary, and from 1865 to 1879 was professor of English literature at the Michigan Agricultural College (Lansing). From 1879 to 1897 he was president of the Kansas Agricultural College (Manhattan), and in 1898 he became vice-president of Berea College (Kentucky), and professor of English literature in that institution. He was ordained in 1871 to the ministry of the Congregational Church. In 1897 he was elected president of the American Association of Agricultural Colleges, and in 1900 published *Rural Wealth and Welfare.*

FAIRCHILD, James Harris (1817—). An American clergyman and educator, born at Stockbridge, Mass. He graduated at Oberlin College (Oberlin, Ohio) in 1838, was appointed a tutor there in the same year, and was ordained to the ministry in 1841. He was professor of languages at Oberlin in 1842-47, professor of mathematics in 1847-58, and professor of moral philosophy and theology in 1858-66. From 1866 until his resignation in 1889 he was president of the college. He became professor of theology in the Oberlin Theological Seminary in 1898, and later professor emeritus. His publications include: *Oberlin: The Colony and the College,* and a text-book of *Moral Philosophy* (1869).

FAIRCHILD, Lucius (1831-96). An American soldier. He was born at Franklin Mills, Ohio; removed to Madison, Wis., in 1846; spent six years (1849-55) in California; then returned to Madison, studied law, and was admitted to the bar in 1860. At the outbreak of the Civil War he was made captain of the Second Wisconsin Volunteers, and subsequently became its colonel and a captain in the regular army, resigning both commissions in 1863. At Bull Run he commanded the famous 'Iron Brigade,' and at Gettysburg was severely wounded while leading a charge at Seminary Ridge. In 1863 he was commissioned brigadier-general of volunteers, but resigned in the same year. Afterwards he served for three terms as Governor of Wisconsin, was appointed Consul at Liverpool in 1872, and Consul-General at Paris in 1878, and was Minister to Spain from 1880 to 1882. In 1886 he was elected Commander-in-Chief of the Grand Army of the Republic.

FAIR'FAX, Donald McNeill (1822—). An American naval officer, a member of the famous Fairfax family of Virginia. He became a midshipman in the United States Navy in 1837, and served under Dupont on the Pacific Coast during the Mexican War. He was promoted lieutenant in 1851 and commander in 1862. He commanded the *Cayuga,* of the Gulf Squadron, under Farragut, in 1862, and in 1863 was transferred to the South Atlantic Squadron, in which he successively commanded the *Nantucket* and the *Montauk* in the attacks of Dupont and Dahlgren on Charleston. In 1864-65 he was placed in command of the Naval Academy. He attained the rank of captain in 1866, of commodore in 1873, and of rear-admiral in 1880, retiring in 1885.

FAIRFAX, Edward (?-1635). An English author, best known as the translator of the *Gerusalemme Liberata* of Tasso. He was born at Leeds, Yorkshire, and lived as a scholar and writer, chiefly at Fuiston, in the same county. He wrote twelve eclogues, of which two have been published, and also, it is said, a *History of Edward, the Black Prince,* never printed. His rendering of Tasso appeared in 1600, as *Godfrey of Bulloigne; or the Recoverie of Jerusalem.* It is in pentameter verse, and continues to be the best English version. It was edited, in two volumes, by S. W. Singer, in 1817.

FAIRFAX, Thomas, third Lord Fairfax (1612-71). An English Parliamentary general, better known as Sir Thomas Fairfax. The son of Sir Ferdinando (afterwards second Lord) Fairfax, he was born at Denton, Yorkshire, January 17, 1612. After receiving his education at Saint John's College, Cambridge, he served as a volunteer in Holland under Lord Vere of Tilbury, whose daughter Anne he married shortly after his return to England. Although he was knighted in 1640 by Charles I., he declared for the Parliamentary cause, and was appointed cavalry general under his father, who commanded the northern Parliamentary forces. He distinguished himself at Marston Moor, July 2, 1644. On the resignation of the Earl of Essex he was appointed commander-general of the Parliamentary forces, with Cromwell as lieutenant-general. On June 14, 1645, Fairfax, seconded by Cromwell and Ireton, gained a great victory at Naseby. Fairfax refused to march against the Scots, who had proclaimed Charles II. King, and Cromwell succeeded him as commander-in-chief. Fairfax retired into private life with a pension of £5000, and devoted his leisure to literary pursuits. After Cromwell's death he represented Yorkshire in Richard Cromwell's first Parliament. He was leader of the delegates appointed to confer with Charles II. at The Hague. He spent his last years in retirement at Bilburgh, near York, where he died, February 12, 1671. *Short Memorials of Thomas, Lord Fairfax* (1699), a record of the Civil War, is the most important of his writings, which included theological, poetical, and other compositions. Consult: *The Fairfax Correspondence* (4 vols., London, 1848-49); Markham, *The Great Lord Fairfax* (London, 1870).

FAIRFAX, THOMAS, sixth Baron Fairfax (1692-1872). An American Colonial painter, the best-known of the Virginia Fairfaxes. He was born in England. His father, Thomas, by marriage with the daughter of Lord Culpepper, had acquired immense estates in Virginia, comprising in all twenty-one counties, lying mostly between the Potomac and the Rappahannock, and forming almost one-quarter of the entire Colony of Virginia. Thomas, the son, after graduating at Oxford, visited his American estates in 1739, and seven or eight years later, as a result, it is said, of a disappointment in love, left England and settled permanently in Virginia. Thither his younger brother, Sir William, had preceded him a few years earlier, and the latter's daughter Anne had become the wife of Lawrence, the elder brother of George Washington. This connection of the Fairfax and Washington families led to the friendship of Lord Fairfax and George Washington, which lasted throughout the Revolution. Lord Fairfax took the young Washington under his protection, employed him in important surveying work of his own, and endeavored to further his interests with the Provincial Government. He was an ardent Loyalist during the Revolution, but being advanced in age and much respected, he was allowed to dwell in peace in his manor house near Winchester. He died soon after the capitulation of Cornwallis at Yorktown.

FAIR'FIELD. A town and port of entry in Fairfield County, Conn., 4 miles from Bridgeport and 52 miles northeast of New York City; on Long Island Sound, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, C 5). A popular summer resort, it has a beautiful situation and one of the finest beaches on the Sound. There are two libraries—the Pequot and the Memorial. The town manufactures rubber goods and paper, and sends a considerable amount of produce to New York markets. Population, in 1890, 3868; in 1900, 4489. Fairfield was settled and incorporated in 1639. Its town hall, originally built in 1720, contains records dating back to 1648. Near Fairfield, in 1637, the Pequot Indians were almost exterminated. On July 6, 1779, Governor Tryon, at the head of a force of Hessians and Tories, entered the town after a sharp skirmish, and on the following day almost completely destroyed it by fire. Consult: Child, *An Old New England Town* (New York, 1895); Osgood, *Centennial Commemoration of the Burning of Fairfield* (New York, 1879).

FAIRFIELD. A city and the county-seat of Jefferson County, Iowa, 112 miles east by south of Des Moines; on the Chicago, Burlington and Quincy, and the Chicago, Rock Island and Pacific railroads (Map: Iowa, F 4). Parsons College (Presbyterian), opened in 1875, is situated here, and there is a fine court-house as well as an attractive public library. The leading manufactures include agricultural implements, wagons, furniture, trunks, brooms, and tile. Settled in 1839, Fairfield was incorporated in 1847. It is governed, under a charter of 1857, by a mayor, elected every two years, and a unicameral city council. The city owns and operates its waterworks and electric-light plant. Population, in 1890, 3391; in 1900, 4689.

FAIRFIELD. A city and the county-seat of Wayne County, Ill., 109 miles east-southeast of Saint Louis, Mo.; on the Southern and the Baltimore and Ohio Southwestern railroads (Map: Illinois, D 5). Hayward Collegiate Institute is situated here. The city has a trade in grain, live stock, tobacco, etc., and manufactures flour, lumber, and jeans. Population, in 1890, 1881; in 1900, 2338.

FAIR'FORD, ALAN. The young friend and correspondent of Darsie Latimer, in Scott's novel *Redgauntlet* (1824). In the character Scott probably meant to portray himself and his visits to Mrs. Waldie, of Kelso.

FAIR GOD, THE. A story of the conquest of Mexico, by Lew Wallace (1873). The fair god was Quetzal, a Mexican divinity who introduced civilization and disappeared. According to a legend, he was to return under conditions partly fulfilled by Cortez, whose victory over Montezuma was thus made easier.

FAIR HAVEN. A town in Bristol County, Mass., on the Acushnet River, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, F 4). It lies opposite New Bedford, three-fourths of a mile distant, with which it is connected by two bridges, as well as by ferry and electric railroad. It has a good harbor. The town is increasing in popularity as a summer resort, and is equipped with a handsome town hall and the Millicent Public Library, of 15,000 volumes. There are fishing and shipbuilding interests, and manufactures of tacks, nails, iron castings, cut glass, whale-boats, and oil-casks. The government is administered by annual and special town meetings. Fair Haven was separated from New Bedford and incorporated as a town in 1812. On September 7, 1778, the militia commanded by Major Israel Fearing repulsed a British attack here. Population, in 1890, 2919;

in 1900, 3567. Consult Ricketson, *The History of New Bedford* (New Bedford, 1858).

FAIRHAVEN. A city in Whatcom County, Wash., 90 miles north of Seattle; on Bellingham Bay, an arm of Puget Sound, and on the Great Northern and the Northern Pacific railroads (Map: Washington, C 1). It is in a fertile agricultural region, and has extensive salmon-canning, and lumber, shingle, and tin-can manufacturing interests. A State normal school is situated between this city and New Whatcom. Settled in 1888, Fairhaven was incorporated in 1890, and is now governed under the charter of that date, which provides for a mayor and a city council, elected on a general ticket. Population, in 1890, 4076; in 1900, 4228.

FAIR HAVENS (Gk. Καλοὶ Λιμένες, *Kaloi Limenes*). An anchorage on the south coast of Crete, about five miles east of Cape Matala (Litinos), mentioned in Acts xxvii. 8, in the narrative of Paul's voyage to Rome. After being forced by strong northwest winds to round Cape Salmone (at the eastern extremity of Crete) and run under the lee of the south coast of the island, the ship arrived at Fair Havens. Here a stop of some duration was made, after which, though contrary to Paul's advice and warning, the captain made the attempt to reach Phœnix, a more suitable winter harbor some distance to the west. The favoring south wind soon changed to the northeast hurricane Euraquilo, which drove the ship far out into the Mediterranean and finally landed it a wreck on the coast of Malta. Fair Havens is not known to be mentioned in any ancient writing but Acts. The name survives to this day, however, in modern Greek form. There was probably no town at the place, but the town of Lasea was near by. The anchorage is small and well protected from westerly winds.

FAIRHEAD, or Benmore Head. A striking promontory of columnar basaltic rock, 636 feet high, on the north coast of Antrim County, Ulster, Ireland (Map: Ireland, F 1).

FAIR HELEN OF KIRKCON′NELL. A ballad of unknown origin. Helen shields her lover from the shot of a rival by throwing herself in front of him, and is killed, while the murderer is slain by the rescued lover. The same story appears in Wordsworth's *Ellen Irwin.*

FAIR′HOLT, Frederick William (1814-66). An English engraver and author, born in London. He was employed for several years by the Antiquarian Society and the British Archæological Association of London, to make drawings for their publications. All his work as an illustrator is valuable from an archæological standpoint, especially *Costume in England* (1846), the text of which he wrote himself. Other works which he wrote and illustrated are: *Tobacco: Its History and Associations* (1859), and a *Dictionary of Terms Used in Art* (1854). He supplied the designs for Charles Knight's *Shakespeare,* Halliwell's *Life of Shakespeare* (1848), and Hall's *Mansions in England* (1843-45). His collection of Shakespeareana was left to the town of Stratford, and the drawings and notes gathered for his *History of Costume* to the British Museum.

FAIR ISLE. An isolated island, lying about half way between the Orkney and Shetland islands, about 30 miles from either group (Map: Scotland, F 1). Area, 6 square miles. Its coast is practically inaccessible, except on the southeast side. The population numbers about 225 inhabitants, who are engaged in grazing and fishing. The flagship of the Duke of Medina Sidonia, the Admiral of the Spanish Armada, was wrecked at Stromceiler Creek in 1588, and 200 Spaniards escaped to the island. There are lighthouses and fog-signals on the southwest and northeast extremities of the island.

FAIR MAID. A fish; a local name in Virginia for the scup (q.v.).

FAIR MAID OF KENT, The. Joan, daughter of Edmund Plantagenet, Earl of Kent. Her third husband was Edward, the Black Prince, her second cousin, to whom she was married under Papal dispensation, and by whom she became the mother of Richard II.

FAIR MAID OF NORWAY. Margaret, daughter of Eric II. of Norway, and of Margaret, daughter of Alexander III. of Scotland. Although a woman, and of foreign birth, she was recognized as Alexander's successor, but died in 1290, while on her way to Scotland.

FAIR MAID OF PERTH, The. A novel by Sir Walter Scott (1828). The name is applied to the heroine of the story, Catharine Glover, the most beautiful young woman of the city, who marries Henry of the Wynd, the bow-legged smith of Perth, after his victory in the contest between the two rival clans, which took place before the King and his Court in Perth, on Palm Sunday, 1396.

FAIR MAID OF THE EXCHANGE, The. A drama by Thomas Heywood (1607). It was edited for the Shakespeare Society by Barron Field (1837).

FAIR′MONT. A city and the county-seat of Marion County, W. Va., 77 miles southeast of Wheeling; on both sides of the Monongahela River, and on the Monongahela River and the Baltimore and Ohio railroads (Map: West Virginia, D 2). The opposite sections of the city are connected by a suspension bridge. Fairmont has a State normal school and a fine court-house. It is an important coal-mining centre, with a large trade in coal and coke. Its manufactures include flouring-mills, planing-mills, foundries and machine-shops, glass-works, cigar-factories, etc. Population, in 1890, 1023; in 1900, 5655.

FAIR′MOUNT COLLEGE. An institution of learning, situated at Wichita, Kan. The college was first organized in 1892 as a coeducational preparatory school, with the assistance of the Boston Education Society. In 1895 a collegiate department was added, and in 1896 the name of the institution was changed to Fairmount College. It offers courses leading to the B.A., B.S., B.L., and the corresponding masters' degrees. It had an attendance in 1901 of 61, excluding students in the preparatory and musical departments. The library numbers about 20,000 volumes, besides pamphlets.

FAIRMOUNT PARK. See Philadelphia.

FAIR OAKS, Battle of. See Seven Pines, Battle of.

FAIR PENITENT, The. A tragedy by Nicholas Rowe (1703), a close copy of Massinger's *Fatal Dowry.* Calista, on the day of her marriage to Lord Altamont, is found to have been seduced by Lothario, who is killed in a duel with the bridegroom, and Calista stabs herself.

FAIR ROSAMOND. The name commonly applied to a daughter of Lord Clifford. She was the acknowledged mistress of Henry II., and was said to have been kept by him in a bower at Woodstock, accessible only by a labyrinthine approach, which the King followed by means of a silk thread. According to the popular account, she was discovered and poisoned by Queen Eleanor (about 1173).

FAIRSCRIBE. In Scott's *Chronicles of the Canongate*, the friend and man of business of Chrystal Croftangry, and his assistant in writing the *Chronicles*.

FAIRSERVICE, Andrew. The meddlesome, cowardly, amusing gardener of Osbaldistone Hall, in Scott's *Rob Roy* (1818). He guides Frank Osbaldistone to Scotland, and thereafter fastens himself upon him as a body servant.

FAIR SIDEA, The. A play by Jakob Ayrer, which Tieck considered to be the source from which Shakespeare drew the *Tempest*.

FAIRY. An imaginary creature of small size, conceived according to popular superstition as dwelling in a region called Fairyland, and as having a special interest in the affairs of man. The term fairy, however, is also loosely used to include other beings of a similar character like the brownie, elf, fay, gnome, goblin, kobold, pixy, puck, salamander, sprite, sylph, troll, and undine. The character of fairies as portrayed in literature may best be understood by mentioning such typical examples as Shakespeare's *Midsummer Night's Dream*, Spenser's *Faerie Queene*, Milton's earlier poems, Grimm's *Märchen*, and the fairy lore of the Irish tales. Toward mankind fairies are commonly regarded as being beneficent in the main, though sensitive, whimsical, capricious, and often prankish; so that they need to be placated and spoken well of, as in Ireland, where they are termed 'the good people.' But bad fairies also exist, and their influence upon children plays a prominent part in the stories devoted to fairy lore. The imagination of the folk not only conceives of fairyland as a distinct domain, but it peoples hills, valleys, rocks, streams, and trees with fairy inhabitants, or sees fairy footprints, fairy rings, fairy tables, or fairy horses in natural objects and in natural phenomena.

Belief in fairies forms a phase of early folk-thought and it has partly a realistic basis, as in ancient India for example, where popular superstition transformed a lower race of inhabitants like the Nagas into serpent men and serpent women, dwelling in enchanted regions beneath the earth. Fairy lore contains likewise certain elements of ancestor-worship, of mythology, and of older religious beliefs which advancing knowledge looked upon as antiquated and relegated to the domain of the supernatural. The tendency of the folk to perpetuate the lore of the unseen world is very strong, and it is interesting to notice the changes in its attitude as culture progresses. A study of fairy stories is especially instructive in this regard. Extensive collections of these tales among many different peoples have been made through the influence of folk-lorists, and scholars have secured valuable results in this interesting field of research.

It is worth adding that the etymology of the word fairy has been a subject of some discussion. The suggestion to connect it with the Persian word *peri* is even older than Sir Walter Scott's *Essay on the Fairy Superstition;* but the Old French *faerie*, like our word *fay*, which is from OF. *fae*, Fr. *fée*, Ital. *fata*, Lat. *fatum*, fate, points to a Romance origin for this term. To associate the word with the English adjective *fair* (AS. *fæger*) would be merely a popular etymology.

Bibliography. MacRitchie, *The Testimony of Tradition* (London, 1891); Jacobs, *English Fairy Tales* (London, 1893); Grimm, *Deutsche Mythologie* (Berlin, 1875-98); Keightley, *The Fairy Mythology* (London, 1850); Hartland, *The Science of Fairy Tales* (London, 1891); *Journal of American Folk-Lore* (Boston, 1888—). See, also, Folk-Lore; Mythology.

FAIRY QUEEN. See Faerie Queene.

FAIRY RING (because the fairies were supposed to dance there). A spot or circle in a pasture or lawn which is either more bare than the rest of the field, or more green and luxuriant. Frequently a bare ring appears like a footpath, with green grass in the centre, the circle which the ring forms, or of which it might form a part, being some yards in diameter. It is now ascertained that fairy rings result from the centrifugal development of certain kinds of fungi, especially of Agaricus oreades (or Marasmius oreades), Agaricus gambosus, Agaricus coccineus, and Agaricus personatus. The common mushroom (*Agaricus campestris*) shows a tendency to grow in the same manner. Probably the spot where the agaric has already grown is unfitted for its continued nourishment, and the mycelium or spawn extends outward to new soil, the fungus unfitting the soil to which it extends for the immediate nourishment of grass, but enriching it afterwards by its own decay. Fairy rings of large size sometimes occupy the same situation for many years. The circle is almost always imperfect, some accidental circumstance having arrested the growth of the mycelium on one side. For illustration, see Plate of Edible Fungi, under Fungi, Edible and Poisonous.

FAITH (OF. *feid, foit, fei, foi*, Fr. *foi*, It. *fede*, from Lat. *fides*, faith, from *fidere*, to trust; connected with Gk. πείθειν, *peithein*, to persuade, AS. *biddan*, Eng. *bid*). A theological term, derived from the Scriptures, and which should be conformed to their usage. Besides its use to signify the whole body of religious convictions which Christians hold, faith is used in the New Testament in but two main senses: (1) A conviction of the truth of anything. This may be an acceptance upon evidence of any fact, such as a fact of history, and is hence often called an historical faith. It might be called a scientific faith, since it is the same faith which is exercised in believing, upon evidence, any proposition of natural science. By this faith the existence of God is accepted, His truth is received upon communication from Him, Christ is believed to be the Saviour, the doctrine of the Trinity is accepted, etc. (2) It is used of trust in God and Christ, springing from the first kind of faith, but involving an additional element, which is the characteristic element of this kind of faith, the act of trustful self-committal of the soul to Christ. It is substantially a choice of Christ as Saviour and Lord; an act, therefore, of the will *par excel-*

lence, as the first kind of faith is chiefly an act of the intellect. These two great classes—that in which the will is chief, which is accompanied by the movement of the affections (whence it is often called love), and for which the soul is directly responsible before God, and that in which the intellect is mainly concerned—will be found to embrace all varieties of faith spoken of as a Christian virtue in the Scriptures.

The great controversy in theological history in respect to faith may be concisely stated as this: Which of these two kinds of faith is saving faith? The Roman Catholic Church requires both kinds, and has declared it essential to salvation to believe (that is, hold as true) certain doctrines, as those which the Council of Trent promulgated. Catholic writers, however, are not content with a mere intellectual acquiescence, and under the term *fides formata* have included love in faith, and approached very close to the Protestant position. This position is that saving faith is the act of the will, is surrender, holy choice, the acting in view of the offer of salvation as one ought to act, repenting of sin and turning to Christ for salvation, trusting Him, accepting His holy will as the law of the individual life. The Protestant doctrine is that when a man thus believes, his sins are immediately forgiven for Christ's sake. See JUSTIFICATION.

But while faith is thus an act of the will, it is not viewed in the Scripture as an act of man without reference to the operation upon him of God's Holy Spirit. The Pelagian controversy (see PELAGIANISM) was upon this question, and Church doctrine from that time has insisted upon the necessity, to the practical exercise of faith, of the divine activity upon the soul, and of the priority of the divine element in the whole process. God has an active agency, inclining the will by 'persuasions' (Augustine), under which the man acts freely. His act is faith.

FAITH, ACT OF. See AUTO DA FE.

FAITH, RULE OF. That which determines what man is to believe concerning his origin, duty, and destiny. (1) Many persons, denying either the possibility or the fact of a supernatural revelation, maintain that human reason alone, as possessed by all persons of sound mind, is both the source and ground of all religious knowledge and conviction of duty. (2) Others, either denying or depreciating the authority of any external revelation, affirm that every man, in connection with his reason, has an inward revelation to which pertains the supreme authority in the belief of truth and knowledge of duty. (3) The Roman Catholic Church, insisting that truth supernaturally revealed is the rule of faith, teaches that the revelation actually given is partly written (as contained in the Holy Scriptures) and partly unwritten (as contained in the traditions dating from the earliest ages of the Church), and that, consequently, the rule of faith includes both Scripture and tradition. And as the people cannot surely and perfectly understand either of these, the only authorized interpreter of them both is the Church. (4) Protestants believe that all extant revealed truth is contained in the canonical Scriptures of the Old and New Testaments, and therefore teach that these (received by every man, after due inquiry, as the word of God, and interpreted according to his own judgment, enlightened through the use of all accessible helps, human and divine) constitute for him the rule of faith. Among those holding this general principle of Protestantism there are recognized diversities, according as, on the one hand, the authority of the Bible is intensified, or, on the other hand, the sphere of human reason in interpretation of its spirit is enlarged. Also to the consensus of the Church are assigned differing degrees of authority in the interpretation of Scripture among different sections of Protestants. See CREEDS AND CONFESSIONS; RATIONALISM; INFALLIBILITY; BIBLE.

FAITH CURE. A term applied to the practice of curing disease by an appeal to the hope, belief, or expectation of the patient, and without the use of drugs or other material means. Formerly it was confined to methods requiring the exercise of religious faith, such as the 'prayer cure' and 'divine healing,' but has now come to be used in the broader sense, and includes the cures of 'Mental Science,' and hypnotism; also a large part of the cures effected by patent medicines and nostrums, as well as many folk practices and home remedies. By some it is used to include also Christian Science, but the believers in the latter regard it as entirely distinct.

Faith cure, in some of its forms, is as old as human history. The Christian Church has always held that prayer should be offered for the sick, and many sacred relics and favored shrines have had marvelous powers of healing ascribed to them. The Grotto of Lourdes, in France, and the shrine of Sainte Anne de Beaupré, in Quebec, are well-known instances. In each of these places thousands of cures have been wrought, in accordance with the faith of the sufferers in the potency of the blessed waters. These cures seem to many to be the natural consequences of the doctrine taught by the story of the Pool of Bethesda, and various utterances of Jesus and the Apostles are quoted in support of more or less definite teachings and practices of faith healing. About a quarter of a century ago, one Dr. Cullis, of Boston, created a sensation by preaching the efficacy of prayer in the cure of bodily ills. More recently two men have become prominent from their advocacy of the prayer cure. Rev. A. B. Simpson, of New York, teaches that the healing of the body is included in the Atonement, and that, having accepted the Atonement, it is dishonoring God not to claim healing of the body. Simpson follows the Apostolic practice, and anoints with oil. John Alexander Dowie, of Chicago (see CHRISTIAN CATHOLIC CHURCH), maintains a large establishment on the plan of a hotel, which he calls a 'Divine Healing Home.' His method is by prayer and the laying on of hands. He reports many cures, and has accumulated a large sum of money from the voluntary contributions of those who have been healed. Another class of divine healers is the group who have been styled the 'tramp healers,' from their habit of traveling about the country. The most important person in this class is the unfortunate Schlatter (q.v.), the Denver healer, whose autobiography shows that he was the victim of an insane delusion. Most prominent among those forms of healing covered by the broader use of the term faith cure are Christian Science (an account of which will be found in the article on that subject) and 'Mental Science,' of which Dr. P. P. Quimby, of Portland, Me., was the formulator. Mrs. Eddy was a patient of Dr. Quimby, and is believed by some to have derived her 'science' from him. This, however, is denied by Christian Scientists. Since Dr. Quimby's death 'Mental Science' has been espoused by a large number of intelligent people, until there are now many variants. There being no organization and no one to dictate what one shall believe or practice, each 'Mental Scientist' is free to put his own individuality into the movement, formulating his own theory and adapting his practice to his own ideas. This has resulted in the development of a large number of leaders and types of mental healing. Their treatment consists in holding up to the patient ideal conditions of health and happiness, and so freeing his mind from the unhappy condition or unpleasant thoughts which are supposed to have caused the physical disease. Sometimes this is done by conversation and sometimes by silent influence. Both Christian Scientists and 'Mental Scientists' give 'absent treatments,' but the former with the understanding that God heals, while the latter claim that they influence the patient's mind.

Dr. Quimby discovered his theory of 'Mental Science' through experimenting with hypnotism. A boy whom he was in the habit of hypnotizing pretended to diagnose disease while in the hypnotic state, and also prescribed a remedy. Dr. Quimby quickly discovered that the boy always named the disease in accordance with the belief of the patient, and also that the remedy prescribed, although it might be a perfectly inert substance, effected a cure. From this he concluded that it was the faith of the patient that was responsible for the cure. He therefore abandoned hypnotism and proceeded to explain his theory to his patients. When he succeeded in making them understand the doctrine, the cure followed. He had many patients, and is said to have wrought many cures. It did not occur to Quimby to try hypnosis on the patient, and it has remained for a group of men now living to show the great value of hypnotism in faith cures.

The hypnotist first puts his patient to sleep, in which condition he believes anything that is told him—just as in our ordinary dreams the most absurd situations are accepted without question. The faith of the hypnotized subject is perfect, for the reason that no doubts can possibly enter his mind. The method of treating disease is very simple. Having put the patient to sleep, the hypnotizer persistently assures him that he is getting well or is already well. The exact formula is governed by the character of the disease. In severe or chronic cases he is usually content to declare at the first sitting that there will be improvement, and at future sittings he makes stronger assertions until he finally declares that the trouble is entirely removed and will not return. Hypnotism is the most scientific and the safest form of faith cure. Many people object to it from ignorance of the nature of hypnotism. But when it is understood that it is not the influence of one mind over another, and that one cannot be hypnotized against his will, this form of faith cure will take its place as one of the regular methods of combating disease.

Besides these recognized forms, faith cure is an important element in cures wrought by patent medicines and nostrums, home remedies and folk practices. The advertisement, testimonial of friend, or family tradition arouses the faith of the sick man, and he comes to believe that he needs only to follow directions to be fully cured. The actual value of faith cure as a therapeutic method has been the subject of much discussion. It can no longer be denied that it has value. From divine healing to patent medicine and Father Kneipp's (q.v.) water cure, all cure disease. Each appeals to a particular type of mind, but the results are practically the same in all—same diseases cured, same successes, same failures. Many faith-curists claim that all diseases in all persons can be cured by their method; others hold that the principle is of limited application. Of them all, the hypnotists are the only ones that do not make sweeping claims.

In estimating these claims, many things must be considered. It has never been proved that any disease which is incurable by ordinary methods has been cured by faith. Many claims are made, but it is impossible to prove them. The difficulties are well-nigh insurmountable. First is the matter of diagnosis. No physician can be sure of his diagnosis in all cases. A man is sick: death proves that he was suffering from cancer; recovery shows that it was a non-malignant tumor. In consumption, the only infallible test is a microscopic examination. Next to diagnosis must be considered what is called *medicatrix naturæ*—the healing power of nature or the natural tendency to recovery. Scientific studies of this subject have shown that the lists of faith cures contain a large percentage of cases that would have recovered without any treatment. Thirdly, the cure must be proved as well as the disease. Many a recovery is announced which proves to be only a temporary renewal of strength. When later the patient relapses, this is either not mentioned or is attributed to another cause. In addition to these difficulties, and complicating them, is the notorious untrustworthiness of human testimony—the tendency to exaggeration and the infrequency of impartial judgment.

The actual cures, however, are sufficiently numerous and sufficiently striking to need an explanation. These different forms agree in only one point—viz. the mental state of the patient is one of hope and expectation. Can states of mind cause or cure disease? Some familiar occurrences seem to justify an affirmative answer. It is well known that certain glands and secretions are markedly affected by emotions. Fright causes the saliva to cease to flow and the perspiration to start. Sorrow causes the lachrymal glands to secrete tears. Happiness favors digestion, unhappiness retards it. Mosso has demonstrated that the bladder is especially sensitive to emotional states. In general, the pleasant emotions produce an opposite physical effect from the unpleasant ones. There are many glands within the body whose action under emotion we cannot observe; but we may reasonably assume that they also are affected by emotional states. Hence, if unpleasant emotions so act upon the glands as to derange the system and cause disease, the pleasant emotions may reasonably be assumed to tend to restore the normal functions. The various forms of faith cure tend strongly to put the patient in a happy frame of mind—a condition favorable to health. However, there are all degrees of faith and wide differences in the way the system responds to the emotional state. One person is slightly affected by a strong emotion; another is strongly affected by a weak emotion.

Hence, there must always be a wide difference in the results of faith-cure methods. The diseases most amenable to faith cure are nervous—including many not recognized as nervous, but having a neural condition as their basis—and functional derangements. Organic diseases are not usually cured, though the symptoms are frequently ameliorated. Chronic diseases due to neuro-muscular habit often yield to hypnotic treatment. See Hypnotism.

FAITHFUL. An allegorical character in Bunyan's *Pilgrim's Progress.* He accompanies Christian on his journey, but is burned to death at Vanity Fair.

FAITH′FULL, Emily (1835-95). An English philanthropist. She was born at Headley Rectory, Surrey, and was educated at Kensington. Becoming interested in the condition of working women, she founded in London a printing establishment, known as 'The Victoria Press' (1860), in which women were employed as compositors. The undertaking met with great opposition; but the Queen showed her approval by appointing Miss Faithfull publisher-in-ordinary to Her Majesty. In 1863 she started the *Victoria Magazine,* in which were set forth the claims of women to remunerative employment. In 1868 she published a novel, entitled *Change Upon Change.* She also appeared as a lecturer, visiting the United States in 1872-73 and 1882. She died May 31, 1895. Consult *Three Visits to America* (Edinburgh, 1884).

FAITHFUL SHEPHERDESS, The. A pastoral drama by John Fletcher (about 1610). From it Milton drew for parts of his *Comus.*

FAIT′HORNE, William (1616-91). An English engraver, born in London. During the Civil War he took the part of the monarchy, and was banished to France, where he remained until 1650. While in Paris he studied under Robert Nanteuil. He left forty-three plates, chiefly portraits of eminent persons, after Lely, Van Dyck, and others. His execution is clear and finished, and some of his plates are of great value, especially "Lord Paston"; "The Duchess of Cleveland," after Lely; and "Lady Paston," after Van Dyck. He also engraved two curious maps, one of London (in the National Library, Paris), and one of Virginia and Maryland (in the British Museum). His works were catalogued by Louis Fagan (London, 1888). Faithorne wrote *The Art of Graveing and Etching* (1662), dedicated to his master, Sir Robert Peake.

FAIZABAD, fī′zȧ-bäd′, or **FYZABAD.** A division of Oudh, British India (q.v.). It is watered by the Gogra and Gumti, and embraces a region rich in antiquities. Agriculture is in an advanced state of development; rice, wheat, and other grains are extensively cultivated, while cotton, tobacco, opium, and indigo also are produced. Area, 12,045 square miles. Population, in 1891, 6,794,270; in 1901, 6,907,000. Capital, Faizabad (q.v.).

FAIZABAD, or FYZABAD. The capital of a division of the same name, Oudh, India, on the Gogra, 78 miles east of Lucknow, with which it is connected by rail (Map: British India, B 3). With its ancient suburb, Ajodhya, the Jerusalem of the Hindus, which is said formerly to have covered 96 square miles, it contains 36 Hindu temples, 114 mosques, an Imambarah, and a vast quantity of ruins overgrown by jungle. The great fair of Ramnaumi is annually attended by half a million pilgrims. Its prosperity, which had declined after the death of Bahu Begam, in 1816, has revived under British rule, and an important trade in wheat and rice is carried on. The city is the headquarters of a British commissioner. Population, including military cantonment, in 1891, 79,000; in 1901, 74,100.

FAIZABAD. The capital of the semi-independent Afghan State of Badakhshan, on the Kokcha, 180 miles northeast of Kabul (Map: Afghanistan, M 2). It is celebrated for its ruby-mines.

FAJARDO, fȧ-Här′dō. A river port near the northeastern coast of Porto Rico, near the mouth of the Fajardo River (Map: Porto Rico, D 2). It is situated in a sugar-manufacturing district, and exports tortoise-shell in considerable quantities, besides sugar and molasses. Population, about 9000.

FAKHR-AD-DIN AR-RAZI, fäk′r-ȧd-dên′ är-rä′zê, also known as Ibn al Khatin (1149-1210). A Mohammedan philosopher and theologian. He was born at Rai, Tabarestan; first studied with his father, and later at Mery and Maragha, where he was one of the pupils of Al Majd al Jili, who in turn had been a disciple of Al-Ghazali. He was accused of rationalism, despite the fact that he restored many to the orthodox faith. Nevertheless, his commentary on the *Koran,* entitled *Mâfatih-al-haib* (best ed., 6 vols., in the year 1278 of the Hejira), is the most varied and many-sided of all extant works of the kind, comprising most of the material of importance that had previously appeared. Fakhr-ad-din also devoted himself to a wide range of studies, and is said to have expended a large fortune on experiments in alchemy. He taught at Rai and Ghazni, and became head of the university founded by Mohammed Ibn Tukush at Herat.

FAKIR, fȧ-kēr′ (Ar. *faqīr,* beggar, religious mendicant, from *faqura,* to be poor). In general, a religious mendicant; more specifically, a Hindu marvel-worker or priestly juggler, usually peripatetic and indigent. The fakir may be regarded as a differentiated shaman or sorcerer, standing midway between the best and the worst products of the original class—i.e. between priest and beggar. There are, however, many classes, defined chiefly by cult, but also by race, school, or particular craft. In Mohammedan countries fakirs are usually divided into two classes—the orthodox, or those 'within the law,' and the heterodox, or those 'without the law.' In portions of India, also, there is a particularly orthodox or elevated class, known as yogis, with a much larger irregular or outlaw class; and in some sections the fakirs grade into dervishes, some of whom engage in religious rites or invocations involving peculiar postures or movements, such as spinning on the toes with outstretched arms for hours at a time. The Hindu fakirs are probably the most expert jugglers in the world, and many of their feats have puzzled the most acute Western students—some have never been fully explained. They appear to be adepts in sleight-of-hand, in hypnotism, in ventriloquism, in producing illusions, and in controlling organic reactions by voluntary effort, and many of the current devices of jugglery in other parts of the world have been borrowed from them. The parallelism between the Hindu fakir and the Amerind shaman is particularly close, as in the mango trick of the one and the corn trick of the other. In both cases the plant is apparently grown in sight of the spectators, in a few minutes, from the seed, through the tender shoot, the forming bud, the full bloom, the immature fruit, and the ripened product, all by an ingenious series of illusions, but the Oriental trick has become little more than a feat of jugglery; the Occidental one remains a part of a solemn religious ceremony. See SOPHIOLOGY.

FALAISE, få′lâz′. The capital of an arrondissement in the Department of Calvados, France, on the Ante, 31 miles southeast of Caen by rail (Map: France, F 3). It is built on a bluff (falaise), whence its name. The chief buildings are the two Gothic churches, the hospital, the public library, and the ruined castle, once the seat of the dukes of Normandy, and the birthplace of William the Conqueror, a statue of whom stands on the Place Saint Gervais. In the castle, the chamber in which the Conqueror was born is shown, as well as a round tower, 130 feet high, called 'Talbot's' tower, which was built by Talbot, who was lord warden of the district, after the capture of Falaise by Henry V. of England. Falaise has manufactures of cottons, hosiery, and bobbinet. An important annual horse and cattle fair, dating from the eleventh century, is held in August, at Guibray, a suburb. Population, in 1901, 7657.

FALANAKA, fä′lå-nä′kå (Malagasy word). A peculiar fossorial civet (*Eupleres Goudotii*) of Madagascar, remarkable for its slender skull and the weakness of its jaws and the small size of the teeth, which are insectivore-like, and, with other characteristics, make this animal the most aberrant of the Viverridæ. Accordingly it is placed in a subfamily (Euplerinæ) by itself.

FALASHAS, få-lä′shåz (Ethiop., wanderers). The inhabitants of the Abyssinian Kingdom of Amhara. They claim to be of Jewish race and to be descended from emigrants of the period of disorder in Israel during and following the reign of Jeroboam. Whether they are true Jews, or descendants merely of proselytes of the period of close connection between Abyssinia and Israel, is uncertain. They practice debased Jewish rites, but are not acquainted with the Babylonian or Jerusalem Talmud, make no use of the *tephillin*, and observe neither the Feast of Purim nor that of the Dedication of the Temple. They possess, in Geez, an Ethiopic dialect of great antiquity, the foundation of the Amharic, the canonical and apocryphal books of the Old Testament; a volume of extracts from the Pentateuch, with comments, given, as they think, from God to Moses on Mount Sinai; the Te-e-sa-sa Sanbat, or laws of the Sabbath; the Ardit, a book of secrets revealed to twelve saints, which is used as a charm against disease; lives of Abraham, Moses, etc., and a translation of Josephus, called Sana Aihud. A copy of the Orit, or Mosaic law, is kept in the holy of holies in every synagogue. Various pagan observances are mingled in their ritual; every newly built house is considered uninhabitable till the blood of a sheep or fowl has been spilt in it; a woman guilty of a breach of chastity has to undergo purification by leaping into a flaming fire; the Sabbath has been deified, and, as the goddess Sanbat, receives adoration and sacrifice, and is said to have ten thousand times ten thousand angels to wait on her commands. There is a monastic system, said to have been introduced in the fourth century. The monks must prepare all their food with their own hands, and no lay person, male or female, may enter their houses. Celibacy is not practiced by the priests, but they are not allowed to marry a second time, and no one is admitted into the order who has eaten with a Christian, or is the son or grandson of a man thus contaminated. Belief in the evil eye or shadow is universal, and spirit-raisers, soothsayers, and rain-doctors are in repute.

Education is in the hands of the monks and priests, and is given only to boys. Fasts, obligatory on all above seven years of age, are held on every Monday or Thursday, on every new moon, and at the Passover (the 21st or 22d of April). The annual festivals are the Passover, the Harvest Feast, the Baala Mazâlat or Feast of the Tabernacles (during which, however, no booths are built), the Day of Covenant or Assembly, and Abraham's Day. It is believed that after death the soul remains in a place of darkness till the third day, when the first *taskar* or sacrifice for the dead is offered; prayers are read in the *mesgeed* (synagogue) for the repose of the departed, and for seven days a formal lament takes place every morning in his house. No coffins are used, and a stone vault is built over the corpse so that it may not come into direct contact with the earth. The Falashas are an industrious people, living for the most part in their own villages, or, if they settle in a Christian or Mohammedan town, occupying a separate quarter. They engage in agriculture, manufacture pottery, ironware, and cloth, and are especially sought after for their skill in mason-work. Their number is variously estimated at from 100,000 to 250,000. Consult: Flad, *The Falashas of Abyssinia*, English translation (London, 1869); Stern, *Wanderings Among the Falashas in Abyssinia* (London, 1862); Halévy, *Travels in Abyssinia*, English translation (London, 1878). M. Halévy was a Jew, sent to Abyssinia to offset the effects of Christian missionary work.

FALB, fälp, RUDOLF (1838—). An Austrian meteorologist, born at Obdach, Styria. He studied theology at Gratz, and although ordained to the priesthood subsequently became converted to Protestantism. From 1869 to 1872 he studied mathematics, physics, geology, and astronomy at Prague and Vienna, and from 1877 to 1880 he traveled through North and South America. Subsequently he became established at Berlin. He became widely known by his theory that the influence of the sun and moon, exercised conjointly on the atmosphere and on the molten material beneath the earth's surface, produces earthquakes and other disturbances of nature. This theory has, however, found no acceptance among scientists. He is popularly known for his predictions of 'critical days.' In 1868 he founded the popular astronomical periodical *Sirius* (conducted from 1882 by Klein). His works include: *Von den Umwälzungen im Weltall* (3d ed. 1890); *Das Wetter und der Mond* (2 ed. 1892); *Kalender der kritischen Tage* (1892 et seq.).

FALCK, fälk, NIELS NIKOLAUS (1784-1850). A German jurist. He was born at Emmerlef, Schleswig, and was educated at Kiel. In 1814 he became professor of law at Kiel, and in 1838 he was appointed president of the Schleswig-Holstein Assembly of the States, but lost the support of the Liberals by his vacillating policy. He published a *Juristische Encyklopädie* (5th ed. 1851), and was a prolific author in the history and jurisprudence of Schleswig-Holstein. His works include: *Handbuch des schleswig-holsteinischen Privatrechts* (1825-48); and *Sammlungen zur nähern Kunde des Vaterlandes* (1819-25). He also edited the *Staatsbürgerliches Magazin* (10 vols., 1821-31; continued as *Neues Staatsbürgerliches Maguzin*, 10 vols., 1833-41).

FALCKENSTEIN, fälk′en-stīn, EDUARD VOGEL VON. See VOGEL VON FALKENSTEIN, EDUARD.

FALCÓN, fȧl-kōn′. A maritime State of Venezuela, occupying the territory around Lake Maracaibo in the northwestern part of the Republic (Map: Venezuela, C 1). Including the former State of Zulia, annexed since 1881, Falcón covers an area of 36,212 square miles. It is traversed by a chain of low mountains, and the soil in the valleys is very fruitful, though the coast regions are dry and barren. The chief products are coffee, cocoa, corn, cotton, sugar-cane, cocoanuts, fruits, and tobacco. Stock-raising is of importance, and the State has some mineral wealth. Population of Falcón, in 1894, 141,689. Maracaibo is the capital.

FALCON (OF. *faucon, falcon*, It. *falcone*, from Lat. *falco*, falcon, from *falx*, sickle). Broadly, any hawk of the family Falconidæ, more usually and scientifically one of those species which, in the language of falconry, were styled 'noble' birds of prey. The true falcons are characterized by a bill curved from the base, the upper mandible hooked at the point, and the cutting edge of the upper mandible furnished with a prominent projection or 'tooth.' The claws are also sharp, curved, and strong; and in accordance with all this powerful armature the whole frame is very robust and muscular. The legs are rather short, and have great power in striking or seizing prey. The breast-bone and shoulder-girdle are large and adapted for the attachment of powerful muscles; the wings are long and pointed. The true falcons are bolder in proportion to their size than any other of the Falconidæ, even the eagles. Their acuteness of vision is wonderful, and they have very great powers of flight. A falcon is recorded as having traversed the distance between Fontainebleau and Malta, not less than 1350 miles, in 24 hours. They soar to a prodigious height in the air, always endeavoring to outsoar any bird of which they may be in pursuit, and to swoop down upon it from above; although it is far more difficult for them to rise vertically in a calm atmosphere than for birds of short and rounded wing, and they either rise obliquely—often making their onward flight in a series of arcs—or avail themselves of the wind, and by flying against it are borne aloft as a boy's kite is.

The species are numerous and widely distributed. Some of them are of very wide range, while others are peculiar to certain countries or climates. The best-known American species are the gyrfalcon (q.v.), formerly confused with the Iceland falcon and the Greenland falcon, and the peregrine falcon, known in the United States as duck-hawk, of which the female is *par excellence* 'the falcon' of falconers, and the male is the 'tercel,' 'tiercel,' or 'tercelet.' The hobby (*Falco subbuteo*); the red-footed or red-legged falcon (*Falco rufipes*), a small species, much resembling the hobby; the merlin (*Falco æsalon*); and the kestrel or windhover (*Falco tinnunculus*), are common and well-known English species. The gyrfalcon and peregrine are European also. The name falcon is sometimes extended to cover all of the various birds included in the Falconidæ, some 350 species, of which about one-tenth occur in the United States. The birds commonly called buzzards, eagles, kites, hawks, harriers, ospreys, and caracaras (qq.v.) are usually included in that family, but it is obviously confusing to call them all falcons, and the word is better restricted therefore to the genus Falco, in its present restricted sense.

For the use of falcons in sport, see FALCONRY; for books relating to the family, see BIRDS, and consult Fisher, *Hawks and Owls of the United States* (Washington, 1893); and for portraits, see Plates of EAGLES AND HAWKS, and FALCONS AND FALCONRY.

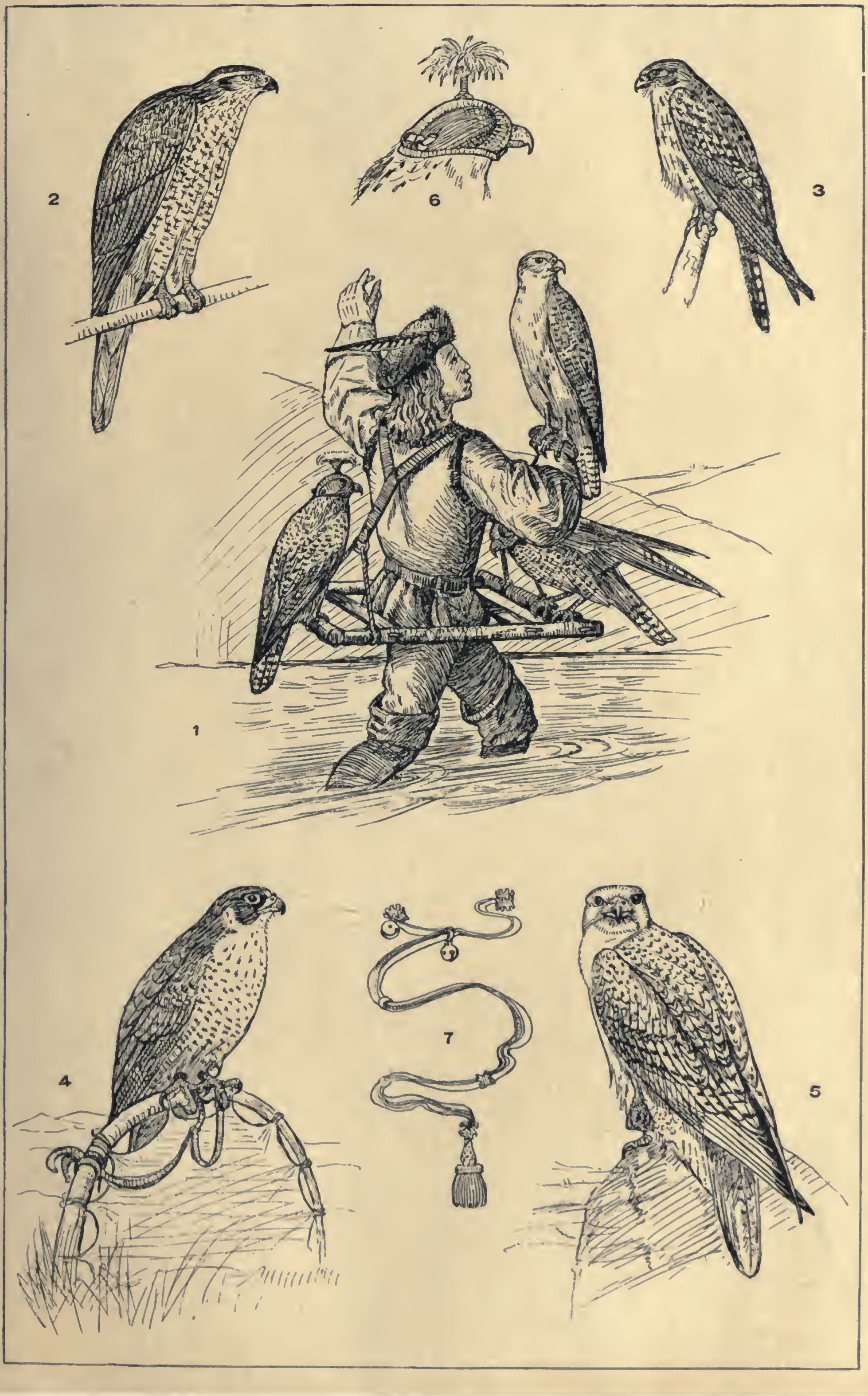
FALCON. A small mediæval gun. They were generally long (20 to 30 calibre) and light. While some are said to have been of sufficient size to throw shot of six pounds weight, the majority were much smaller. In the sixteenth century Henry II. of France decreed that the *falcon* should fire a ball of one pound weight, and that the *falconet* should use one weighing one-half pound. See ARTILLERY.

FALCÓN, fȧl-kōn′, JUAN CRISÓSTOMO (1820-70). A Venezuelan soldier and politician, born on the peninsula of Paraguaná (State of Falcón, then Province of Coro). In 1858 he became the leader of the Federalist revolutionary movement in Coro, and in 1863 entered Caracas in triumph and was elected President of Venezuela. He sanctioned the promulgation of a new constitution in 1864. Overthrown in a revolutionary riot three years later, he withdrew to Europe, whence, upon the success of a counter-revolution, he was summoned again to assume office. He died on the return voyage.

FALCONE, fäl-kō′nȧ, ANGELO, or ANIELLO (1600-65). An Italian battle-painter and etcher, born in Naples. He was a pupil of Giuseppe Ribera (q.v.), and himself founded a large school. His work being mostly confined to battle pieces, he was called 'L'oracolo delle battaglie.' At the outbreak of the revolt of the Neopolitans under Masaniello against Spain, he organized his pupils into the 'Compagnia della morte,' which never spared a Spaniard. For this he was compelled to flee to France, where he was well received. Under the protection of Colbert he returned to Naples, where he died in 1665. His paintings, of which not many survive, are full of life and animation, are brilliant in color and correct in drawing. As he seldom signed them, they are confounded with those of Salvator Rosa, also a pupil of Ribera. The Prado (Madrid) possesses many of his battle pieces, the Louvre one, and the Museum of Naples two. He was also an etcher of note, executing with a light and spirited point.

FALCONER, fa̤′k′nẽr, EDMUND (1814-79). The assumed name of Edmund O'Rourke, an English actor and playwright. He was born in Dublin, Ireland, first performed on the English provincial stage, and afterwards went to London, becoming manager of the Lyceum Theatre (1858, and again in 1861), and of Drury Lane (1862). He wrote for other theatres, and was in the

FALCONS AND FALCONRY



1. A FALCONER OF THE 17th CENTURY, CARRYING HAWKS AFIELD.
2. GOSHAWK (Astur palumbarius).
3. KESTREL (Tinnunculus alaudarius).
4. PEREGRINE FALCON (Falco peregrinus), on portable perch.
5. GYRFALCON (Falco gyrfalco).
6. A FALCON'S HOOD.
7. A FALCON'S JESSE, WITH BELLS.

United States for three years (1867-69), connected with the Olympic Theatre in New York. Returning to England, he died September 29, 1879. He composed or adapted many plays, of which the most popular was *Peep o' Day* (1861), founded on one of Banim's stories of Irish life. As an actor he was admirable in Irish rôles.

FALCONER, Hugh (1808-65). A Scottish botanist and paleontologist, born at Forres (Elginshire). He graduated at the University of Aberdeen in 1826, studied medicine at the University of Edinburgh in 1826-29, was appointed assistant surgeon in the service of the East India Company in 1829, and in 1832 became superintendent of the botanic garden at Saharanpur (Northwestern Provinces), India. His investigations led to the discovery in the Sivâlik Hills of large numbers of important vertebrate fossils. For his work in connection with these remains he obtained the Wollaston medal of the Geological Society of London in 1837. It was on his recommendation, in a report to the Government of Bengal, that the culture of the tea-plant was introduced into India. He also discovered the asafœtida plant, and was the first to give a description of it. During his residence in England on sick leave in 1843-47 he prepared the India fossils of the British Museum for exhibition. In 1847 he received appointment as superintendent of the Calcutta Botanic Garden, and professor of botany in the medical college there. He was elected foreign secretary of the Geological Society, and a vice-president of the Royal Society. He edited a large incomplete work entitled *Fauna Antiqua Sivalensis* (1846-49; nine parts with illustrations of 1123 specimens, and one volume of text), and published a *Descriptive Catalogue of the Fossil Remains from the Sewalik Hills* (1859). Considerable unpublished material was edited by C. Murchison as *Palæontological Memoirs and Notes of the Late Hugh Falconer* (London, 1868). Consult the biographical notice in the first volume of that work, and the *Royal Society's Catalogue of Scientific Papers*, vol. ii. (London, 1868).

FALCONER, William (1732-69). An English poet, son of a poor barber. He was born in Edinburgh. He went early to sea, and before he was eighteen years of age he was second mate in a vessel in the Levant trade, which was shipwrecked off Cape Colonna in Greece. Of the crew only he and two others were saved. The story of this voyage he related in a poem called "The Shipwreck" (1762). Entering the Royal Navy, he was appointed purser on the frigate *Aurora*, which was about to sail for India. The *Aurora*, after touching at the Cape of Good Hope, December, 1769, was lost. All the crew perished. "The Shipwreck" passed through three editions before this tragic event, and is still an interesting poem. Falconer wrote a political satire entitled *The Demagogue* (1764), and compiled a nautical dictionary (1769). His *Poetical Works* were edited, with a *Life*, by Gilfillan (London, 1854).

FALCONET, fȧl'kô'nȧ'. Etienne Maurice (1716-91). A French sculptor, born in Paris. He was the pupil of Lemoine. His first works include "Milo of Crotona," a vigorous study; "Pygmalion," "A Bather," and "Christ in Agony," and an "Annunciation," in the Church of Saint Roch, Paris. In 1766 Catharine II. of Russia sent for him to model an equestrian statue of Peter the Great at Saint Petersburg. This is his chief work. It took him twelve years to complete it, but it has little originality. After his return to France he devoted himself principally to writing. His literary works are mostly concerned with his own art, and were collected as *Œuvres littéraires* (1781-82). The charm of Falconet as a sculptor is apparent in his graceful, seductive "Winter," "Correction," "The Three Graces," "Venus and Love," "Recompense," and "Music." His modeling is correct, and his work is full of sentiment.

FALCONIFORMES, făl'kon-ĭ-fôr'mêz. An ordinal term, used by Evans and some recent ornithologists, for the raptorial birds, including (1) the Cathartidæ and (2) the Accipitres, the latter embracing (a) the Falconinæ and (b) the Pandioninæ.

FALCONNETTO, fäl'kô-nĕt'tô, Giovanni Maria (1458-1534). An Italian architect and painter, born in Verona. He studied under his father, Jacopo Falconetto, and probably under Velozzo da Forlì, but was by preference an architect. His chief works in painting were the frescoes in the Church of San Pietro Martire in Verona, a series of religious allegories somewhat in the manner of his master. More important are his architectural works at Padua, where he built a part of the Palazzo del Capitaneo, two pavilions of the Palazzo Giustiniani (1524), and several of the city gates.

FALCONRY. The art of training falcons born in a state of freedom so that when they have flown and captured their quarry they will, instead of devouring it, give it up to their trainer. They will pursue and capture on the wing the heron, partridge, lark, rook, magpie, wild duck, pigeon, and rabbit, and in India game as large as the deer. In ancient times this sport was called hawking, a term still preserved in many places. Nowadays falconry is the term applied to the sport and all that pertains to it; hawking, to its actual practice out in the field. Falconry as a sport is of very ancient origin. It was practiced in Eastern countries and in central Europe long before it became established in Great Britain. In England, after the Norman Conquest, it was much indulged in by kings, nobles, and ladies; and in those days the rank of the individual could be indicated by the particular species of hawk carried on his wrist. Thus an earl carried a peregrine falcon. The literature of the fourteenth, fifteenth, and sixteenth centuries teems with allusions to it. In the seventeenth century the sport declined; in the eighteenth century it partially revived, but again fell off about the year 1727, when the art of shooting birds on the wing became the fashion. In the present day its restoration in England, Holland, and France is attended with growing success, though no country in the world has such a variety of hawks, or such opportunities for flying them, as the United States, in which country and Canada several successful clubs have been organized for the encouragement of the sport. In Spanish America hawking was long esteemed as a favorite sport. In the East, from China to Morocco, falconry still maintains its old-time position as a field sport.

In falconry two distinct kinds of hawks are used—the long-winged, or true falcons, and the short-winged. The first are represented chiefly by the gyrfalcon and peregrine; the second by the goshawk and sparrow-hawk; and though for certain purposes the male is superior, as a rule the females of each species are much more highly esteemed for sporting purposes, from their being larger and more powerful. 'Long-winged' hawks may also, as a rule, be distinguished from the 'short-winged,' by their having a 'tooth' or notch on the upper mandible; from the second feather of the wing being either longer or as long as the third; and from their impetuous 'stoop' when they descend from a height on their prey.

ANCIENT FALCONRY.
(From an old manuscript in the British Museum.)

The gyrfalcon (q.v.) is the largest species, but the peregrine is in greatest favor with falconers, and if taken from the nest, as is usually the case, and carefully trained, affords great sport. No hawk is fit for sporting purposes until it has undergone a careful process of training. The young hawk taken from the nest of its wild parent is more easily trained than that which has been trapped in a wild state when at maturity, but in either case considerable practice is necessary before the falcon can be considered fully equipped for the sport. The following are the principal terms used in falconry: A falcon's legs from the thigh to the foot are termed *arms;* toes, *petty singles;* claws, *pounces;* wings, *sails;* tail, *train;* crop, *gorge;* lower stomach, *pannel;* feathers, hair, etc., ejected at the mouth, the *castings.* A young hawk from the nest is an *eyess* or *eyas;* one that can hop, but not fly well, a *brancher;* a nestling hawk, reared at liberty, is a *hack-hawk;* a young hawk able to take game, a *soar-hawk;* a mature wild hawk is a *haggard* or *blue hawk;* young hawks taken in their migration are *passage hawks* or *red hawks*—the term *red* being applied merely as a title of distinction between the young hawk and the eyess or nestling, the colors of the two being in reality the same. The training of the passage hawk and haggard is termed *reclaiming;* fluttering is *baiting;* fighting with each other, *crabbing;* sleeping, *jouking.* The prey is termed the *quarry.* When the hawk strikes her quarry in the air and clings to it she *binds;* when she flies off with it she *carries,* when she plucks it she *deplumes.* Dead game is the *pelt. Stooping* or *swooping* is the act of descending with closed wings from a height at the object of its prey. Direct flight, without soaring, is *raking off;* changing from one bird to another, *checking.* When game flies into a cover it *puts in.* When the hawk is molting her feathers she is *mewing;* after her first molt, she is *intermewed;* with complete plumage, *summed;* when in good condition she is *enseamed;* when out of condition, *seamed.* Mending the feathers artificially—a necessary operation if any have been accidentally broken—is termed *imping;* blunting bill and talons, *coping.* The *cadge* is a frame of wood with four legs, carried by means of straps passed over the bearer's (the cadger's) shoulders, and used when there are several casts of hawks to be taken to the field. Falcons are very pugnacious, and if not kept separate would soon kill each other. The *screen* or *perch* is a perch guarded by a falling piece of canvas to support the hawks in case of their leaping down from their block; upon this the hawks are placed at night in an apartment called the mews.

Bibliography. The best of the older works are those of Turberville, published in 1575, and that of Sir John Sebright (London, 1828). For more recent treatises consult: Salvin and Broderick, *Falconry in the British Isles* (London, 1873); Freeman and Salvin, *Falconry, Its Claims and Practice* (London, 1859); Freeman, *Practical Falconry* (London, 1869).

FALEME, fȧ-lā′mȧ. An important tributary of the Senegal River, in western Africa, rising in the French dependency of Futa-Jallon and flowing into the Senegal from the south (Map: Africa, C 3). The direction of its course is a little west of north, and its length is estimated at about 300 miles.

FALERII, fȧ-lĕ′rĭ-ī. A city in the southern part of Etruria, west of the Tiber and the Sabini and north of Mount Soracte. The inscriptions show that its inhabitants, the Falisci, were not Etruscans, but closely allied to the Latins. In the early Roman annals Falerii appears as allied with the Veii and other neighboring enemies of Rome, but was said to have finally joined the Roman league in B.C. 343. For some unknown reason it revolted at the close of the First Punic War, B.C. 241, and was then destroyed by the Romans, who compelled the inhabitants to settle in the plain near by, where is now the village of Santa Maria di Falleri. Here a Roman colony was settled in the time of the triumvirs, whence the place took the name of *Colonia Junonia Faliscorum.* But this Roman Falerii does not appear to have ever acquired any importance, for the temple which anciently attracted so many pilgrims stood on the site of the older town. During the Middle Ages the inhabitants removed to the strong position of the ancient Falerii, which finally obtained the name of *Cività Castel-*

lana (q.v.). Ruins of the Roman or later Falerii, consisting of a part of the ancient walls, are still visible. Excavations in the neighborhood have led to the discovery of extensive cemeteries, containing a series of graves, of great value as indicating the growth of civilization in Italy. Consult Barnabei and Gamurrini, "Antichità del territorio Falisco," etc., in *Monumenti Antichi*, vol. iv. (Rome, 1895). Unfortunately, the accuracy of these reports is open to grave doubts.

FALER'NIAN WINE (Lat. *Falernum*, *Falernum vinum*), one of the favorite wines of the Romans, so called from the Ager Falernus, the district in which it was grown, which lay in the northern portion of Campania, between the Massican hills and the northern bank of the Vulturnus. It is described by Horace as, in his time, surpassing all other wines then in repute. In the time of Pliny, however, Falernian wine had already, owing to a want of care in its cultivation, begun to decline in quality. A wine produced in this district is still known as 'Falerno.'

FALGUIÈRE, fȧl'gyâr', JEAN ALEXANDRE JOSEPH (1831-1900). A French sculptor and painter, born in Toulouse. He studied in Paris under Jouffroy, and won the Prix de Rome in 1859. His large works include the fountain of Saint Mary at Rouen and an allegorical group of the Republic of France for the Arc de Triomphe. His single figures are more successful, and, although lacking in delicacy and elevation, he is always vigorous and technically strong. The Luxembourg has a picture by him, "Fan and Poniard" (1882), which invites the same criticism. Other works by him are "The Winner of the Cock Fight" (1864), a spirited bronze group in the Luxembourg; "Eve" (1880); "Diana" (1882), a very naturalistic nude, which was the sensation of the Salon; the monument of Gambetta for the city of Cahors (1883); "Tarcisius," in the Luxembourg; "The Dancer" (1896); and "The Poet on Pegasus" (1897). His "Saint Vincent de Paul" (1879) of the Panthéon is a finely conceived group, and is considered by many his masterpiece. His "Balzac" was erected in 1902.

FALIERI, fă-lyā'rê, MARINO (c. 1275-1355). A celebrated Venetian Doge, elected to office in 1354, when nearly eighty, after rendering the Republic great service as commander-in-chief at the siege of Zara, in Dalmatia. His bitter resentment seems to have been aroused by an offensive libel on his fair and youthful wife, the author of which owed some grudge to the Doge. The punishment imposed on the young noble by a patrician tribunal seemed to Falieri wholly inadequate, and in order to avenge this double slight he organized an audacious plot with the object of overthrowing the Republic and massacring the heads of the aristocracy, to be followed by his own assumption of sovereign rights. The conspiracy was, however, revealed on the eve of its execution, and Falieri was arrested. He suffered death by decapitation on April 17, 1355. In the hall of the Great Council, which contains the portraits of all the doges, the space allotted to that of Falieri is draped with a veil of sable, and bears the following inscription: "Marino Falieri, executed for treason." Byron has made the fate of Falieri the subject of a drama. Consult Brown, *Venice* (New York, 1893).

FALK, fälk, JOHANN DANIEL (1768-1826). A German author and philanthropist, born in Danzig. After study at the University of Halle he turned to literature, wrote several satirical poems, and in 1797 became, through Wieland (q.v.), a member of the Weimar Literary Circle. When Napoleon's army invaded the duchy in 1806, his knowledge of the French language enabled him to moderate to some extent the spoliation of the country, and later gained for him the post of secretary to Intendant-General Vilain at Naumburg. In 1813 he founded the Society of Friends in Need, and in the same year established at Weimar the first institution in Germany for the care and education of neglected and orphan children. This was taken over by the State in 1829 and still exists as the 'Falksche Institut.' Falk's publications include *Der Mensch und die Helden* (1798), *Oceaniden* (1812), and *Goethe aus näherm persönlichen Umgange dargestellt* (1832; 3d ed. 1856). Consult Stein (Nietschmann), *Johannes Falk. Ein Zeit- und Lebensbild* (Halle, 1881).

FALK, MAX (1828—). An Hungarian politician and publicist. He was born and educated at Pest, entered the Polytechnic Institute at Vienna, and became a member of the Academic Legion in 1848. As editor of the *Wanderer* of Vienna he strongly advocated the restoration of the Hungarian Constitution, and soon after the negotiations concerning the compromise with Hungary had been resumed, he was appointed private lecturer on Hungarian history and literature to the Empress Elizabeth. As editor-in-chief of the *Pester Lloyd* he made his influence widely felt. In 1869 he was elected a member of the Hungarian Parliament, where he identified himself with the party of which Deák, Eötvös, and Andrássy were the most prominent representatives. With Brachelli he published the twelfth German edition of Gallettis's *Allgemeine Weltkunde* (1859-60). His independent literary productions, which include the biography, *Graf Stephan Széchenyi und seine Zeit* (1868, also published in Hungarian), have appeared chiefly in the *Oesterreichische Revue*.

FALK, ADALBERT (1827-1900). A Prussian statesman. He was born at Metschkau, Silesia, August 10, 1827. He was the son of a Protestant clergyman, and studied law at Breslau and Berlin. In 1847 he entered the State service of Prussia; in 1850 he was appointed Assistant State Attorney at Breslau, and in 1853 State Attorney at Lyck. In 1858 he was elected to the Prussian Chamber of Deputies, and served as a member of the committee on petitions, budget, and military affairs, 1858-61. In 1862 he was appointed counselor of the Court of Appeals in Glogau, Silesia, and in 1867 was elected to represent that district in the Provisional Parliament of the North German Confederation. In 1868 he was permanently assigned as counselor of the Ministry of Justice, and devoted himself zealously to the new codification of laws for the North German Confederation, performing a similar work afterwards for the German Empire. In 1871 the Emperor appointed Dr. Falk one of the representatives of Prussia in the Federal Council. In 1872 he succeeded Von Mühler as Prussian Minister for Ecclesiastical Educational Affairs (Kultusminister). He introduced a law, passed March 11, 1872, according to which the supervision of all schools was declared to be the exclusive prerogative of the State. It was carried against the united efforts of the Roman Catholic and conservative Protestant parties of the Prussian Parliament. Falk continued by a number of measures to assert further the exclusive right of the State to legislate in all school affairs. A rescript of June 15, 1872, excluded members of ecclesiastical orders and congregations from positions in the public schools. In May, 1873, an act was passed conferring upon the State the right of supervising Roman Catholic seminaries. It was required also that candidates for the clerical office should undergo a certain amount of secular training at the universities, and that every ecclesiastical appointment should receive the sanction of the secular authorities. A royal tribunal for ecclesiastical matters was also set up. This legislation, which the Pope denounced as invalid, February 15, 1875, was disregarded by the Roman Catholic bishops, and Bismarck, supported by Falk, imposed penalty after penalty in order to establish the supremacy of the State. Refractory bishops were imprisoned, deposed, and banished; the contributions of the Government were withdrawn from the clergy who incurred its displeasure; religious orders were dissolved; and the administration of Church property was taken from the clergy and invested in bodies of laymen. Dr. Falk's policy was no more acceptable to the orthodox Protestant party than to the Roman Catholics, and the difficulties of his position led him to resign in July, 1879. The Falk laws were modified by his successors, Von Puttkamer and Gossler, despite the opposition of Falk as member of Parliament. In 1882 he accepted a high judicial appointment at Hamm, and died there July 7, 1900. His *Reden gehalten in den Jahren 1872-79* appeared at Berlin in 1880. Consult Fischer, *Adalbert Falk* (Hamm, 1900). See KULTURKAMPF.

FALKE, fäl′ke, JAKOB VON (1825-97). A German writer on art, born at Ratzeburg. He was in charge of the Germanic Museum at Nuremberg, and from there was called to Vienna in 1858, where he afterwards became director of the Imperial Museum of Arts and Industry (1885). His works include: *Die Kunst im Hause* (6th ed. 1897); *Die Kunstindustrie auf der Wiener Weltausstellung* (1872); *Hellas und Rom* (1880); and *Aesthetik des Kunstgewerbes* (1883).

FALKE, JOHANNES FRIEDRICH GOTTLIEB (1823-76). A German historian, brother of the preceding. He was born at Ratzeburg, and studied theology, philology, and history at Erlangen. In 1855 he was appointed chief secretary of the Germanic Museum at Nuremberg; and in 1859 he became director of the manuscript department in that institution. In 1862 he was appointed secretary of the Government archives at Dresden, where he occupied the position of archivist at the time of his death. He was founder and co-editor of the *Zeitschrift für deutsche Kulturgeschichte* (1855-59), a periodical devoted to the economic history of Germany. His independent works include *Geschichte des deutschen Handels* (1859-60), and *Die Hansa als deutsche See- und Handelsmacht* (1862).

FALKENSTEIN, fälk′en-stīn, JULIUS AUGUST FERDINAND (1842—). A German explorer. He was born in Berlin, and studied medicine and geology at the university in that city. As a member of the exploring expedition sent by the African Society of Germany to Loango (1873-76), he made important scientific discoveries. His valuable collections included the first gorilla ever transported alive out of Africa. In 1881 he founded the General School Association of Germany, a society formed for the strengthening of German influence in the schools of other countries. His publications include: *Die Loango-Küste in 72 Original-Photographien* (1876); *Die Loango Expedition* (1879); *Afrikans Westküste: Vom Ogowe bis zum Damara Land* (1885); *Aerztlicher Reisebegleiter und Hausfreund* (10th ed. 1893).

FALKIRK, fa̤l′kĕrk. A Parliamentary and municipal burgh and market-town of Stirlingshire, Scotland, about three miles southwest of its seaport, Grangemouth, on the Firth of Forth, and 24 miles northwest of Edinburgh (Map: Scotland, E 4). Falkirk consists principally of a long, irregular street. There is an equestrian statue to the Duke of Wellington, erected in 1854. Among its notable buildings are the town hall, county buildings, art school, free library, and cottage hospital. Its parish church has some ancient monuments, but was itself rebuilt in the year 1810. The church, church lands, and barony belonged of old to the Abbey of Holyrood. It is the centre of the Scotch iron-founding trade, the principal works being at Carron. There are several extensive collieries in the neighborhood, as well as distilleries. Its three annual cattle fairs (trysts), once so famous, have practically been supplanted by a weekly market. Falkirk is a station on the North British Railway, and is connected with the east and west coasts by the Forth and Clyde Canal. Population, municipal burgh, in 1901, 29,271. The town is of great antiquity, having been a place of some importance as early as the eleventh century. On a small eminence near Falkirk an important engagement was fought July 22, 1298, between the English under Edward I. and the Scottish army under William Wallace (q.v.). The Scottish forces were outnumbered nearly three to one, and were driven from the field with the loss of 20,000 men. Wallace was forced to seek concealment, and Edward's hold on the southern part of Scotland was strengthened. Near Falkirk, January 17, 1746, Charles Edward, the young Pretender, defeated an English army under General Hawley.

FALKLAND, fa̤k′l*a*nd. A royal burgh in Fifeshire, Scotland, situated at the northeastern base of the Lomond Hills, 22 miles north of Edinburgh (Map: Scotland, E 3). Population, in 1901, of royal burgh, 809; of civil parish, 2229. It is noted for its sixteenth-century royal palace, built upon the site of an ancient castle of the Macduffs, thanes of Fife, and now the property of the Marquis of Bute, who has had it carefully restored. It is rich in memories of the births, lives, imprisonments, and murders of Scottish princes and kings. In 1715 it was garrisoned by Rob Roy (q.v.). Consult Wood, *Historical Description of Falkland* (Edinburgh, 1888).

FALKLAND. The first novel of Bulwer Lytton, named after its hero, and published anonymously in 1827. It is a singularly gloomy work, described by the author as "to me what the *Sorrows of Werther* was to Goethe."

FALKLAND. The leading character in William Godwin's novel *Caleb Williams,* who, though a man of noble nature, under great provocation commits a murder and conceals the crime by permitting the execution of an innocent person. Williams, who learns the secret of his master's guilt, is persecuted by Falkland until, accused by the latter of robbery, he discloses the truth, and Falkland dies of shame.

FALKLAND, Lucius Cary, second Viscount (c.1610-43). An English writer and politician. He was educated at Trinity College, Dublin, and at Saint John's College, Cambridge. About 1629 he inherited his maternal grandfather's fortune, and devoted himself to literature. By his father's death in 1633 he became Viscount Falkland. In 1633 he was created a gentleman of the Privy Chamber to Charles I., and took part in the expedition against the Scots in 1639. In 1640 he entered Parliament as member for Newport and the Isle of Wight. He opposed Laud during the Short Parliament, and in the Long Parliament took sides against Strafford. He became Secretary of State in 1642, and at the outbreak of the Civil War he joined the King's party. He courted death, and was killed at the battle of Newbury. His principal work is *A Discourse on the Infallibility of the Church of Rome* (1660). His poems, edited by A. Groshart, were published in 1871.

FALKLAND ISLANDS. A Crown colony of Great Britain in the South Atlantic, consisting of the two large islands of East and West Falkland, a large number of small islands, mostly uninhabited, and the uninhabited island of South Georgia (Map: South America, E 8). The Falkland Archipelago is situated between latitudes 51° and 52° 45′ S. and longitudes 57° 20′ and 61° 46′ W., about 300 miles east of the Strait of Magellan (Map: South America, D 8). Its entire area is estimated at about 7500 square miles. The surface is generally low and barren, with some elevation toward the north. The coasts are indented by numerous well-protected harbors. The climate is not unhealthful, but disagreeable on account of strong winds and drizzling rains. The soil yields little more than grass, which grows in abundance. The chief occupation is sheep-farming, and the principal exports are wool, hides, and tallow. The trade is mainly with Great Britain and Uruguay. The annual value of the commerce exceeds $1,000,000, of which about two-thirds consists of exports. The colony is administered by a governor and two councils. Population, about 2000.

The Falkland Islands are supposed to have been visited by Davis in 1592. They received their name from Captain Strong, who sailed through Falkland Strait in 1690. The French established a settlement there in 1763, but were soon expelled by the British, who were in turn driven out by the Spanish. Until 1833 the islands remained under the nominal control of the Republic of Argentina. In 1833 the British again took possession of the group, and established the present colony in 1851, not without some protest on the part of Argentina. The chief town of the colony, Stanley, has a population of less than a thousand. Consult: *British Empire Series* (London, 1900); Murdoch, *From Edinburgh to the Antarctic, 1892-93* (London, 1894).

FALKNER, fąk′nẽr, Roland Post (1866—). An American political economist, born at Bridgeport, Conn. He graduated at the University of Pennsylvania in 1888, and afterwards studied at Berlin, Leipzig, and Halle. After teaching at the Wharton School of Finance and Economy of the University of Pennsylvania for three years, he was appointed associate professor of statistics at that institution (1891), and retained his position until 1900, in which year he was appointed chief of the division of documents in the Library of Congress at Washington. He was secretary of the International Monetary Conference of 1892, and became editor of the *Annals of the American Academy of Political and Social Science* upon the establishment of that publication in 1890. Besides an English translation of August Meitzen's *History, Theory, and Technique of Statistics* (1893), his publications include reports and other contributions, chiefly on statistical subjects.

FALKNER, Thomas (1707-84). An English Jesuit missionary, born in Manchester. As surgeon on board the *Assiento*, a slave-ship belonging to the South Sea Company, he sailed to the Guinea Coast in 1731, and thence to Buenos Ayres, where he was so kindly treated by the Jesuits during a dangerous illness that he determined to enter their Order. He was ordained in May, 1732, and during the following thirty-eight years he worked as a missionary in Paraguay and the vast region between the Rio de la Plata and the Strait of Magellan, mostly among the natives. Upon the expulsion of the Jesuits from South America, he returned to England, where he was chaplain to several distinguished Catholic families. His religious work was materially aided by his medical and surgical skill. He left several works in manuscript, including four volumes, *Botanical, Mineral, and Like Observations on the Products of America* (date unrecorded). Under the title, *A Description of Patagonia and the Adjoining Parts of South America*, a collection of his papers was published in 1774.

FALKÖPING, fäl′kẽ-pĭng. A small town and railway junction in Skaraborg, Sweden. Population, about 2800. It is the scene of the victory in 1389 of Margaret, Queen of Denmark and Norway, over Albert of Mecklenburg, King of Sweden. Her victory enabled Margaret to unite Sweden with the other kingdoms. See on the Union of Kalmar, under Kalmar.

FALL, Doctrine of the. The explanation of the universal prevalence of sin among men by the supposition of the sin of the first parents of the race, resulting in a transmitted disorder of nature. The doctrine was introduced into theology by the Apostle Paul (Rom. v. 12 sqq.) from the account of the sin committed by Adam in Eden (Gen. iii.). Whatever other interpretations are given to that account, it is psychologically correct as to the elements of sin. Thus we find here (a) law (ii. 16, 17); (b) original obedience (ii. 19, 20); (c) temptation, coming from without, presenting the desirableness of a forbidden object, and diminishing the force of restraining motives (iii. 4, 5); (d) contemplation of the good presented in the temptation (iii. 6); (e) the act of choice; (f) condemnation of conscience, evident in the sense of estrangement from God (iii. 8); (g) disorder of nature (iii. 7). That is a faithful picture of every sin. The same disorder appears in all of Adam's descendants, and universal sin attends this disorder.

There have been various theories of the Fall in the history of theology. The Pelagians minimized its importance, denying that Adam's sin injured anybody but himself, and referring the universality of sin to universal bad example, but failing to explain whence comes the universal bad example. The Augustinians made it the true entrance of sin into the race, and taught such a connection of the race with Adam that his sin was truly their sin, and thus all were involved in common condemnation with him, but without any clear theory of the nature of the connection. The Calvinists took up the Augustinian view, and explained it by various theories of imputation (q.v.) and federal headship. (See FEDERAL THEOLOGY.) The Arminians put the loss of the race in subjection to death, with its attendant moral disadvantages. Evangelical Arminians (Wesleyans, etc.) have held to a stricter view.

In recent times the Fall has been attacked from the standpoint of evolution, and one of the most common theological results of the triumph of evolution, in the popular apprehension, has been to overthrow this doctrine. The origin of the race by evolution precludes even the existence of 'first parents,' that is, of any single pair of human progenitors. And even if this difficulty could be overcome, the whole idea of evolution, which is the idea of progress, is against the idea of a primal and disastrous fall. The progress of the race has been by means of its disadvantages, by struggle and survival, and hence error is itself one of the steps upward by which the race ascends. And, then, in a still broader way, sin is the temporary triumph of the lower over the higher, of the animal over the spiritual. Hence it is essentially present in the whole evolutionary process from the lowest to the highest point, which is, in a word, advance from the animal to the spiritual, and cannot have originated in Eden, or been confined to man's present history. These objections are met by the following arguments. The Christian doctrine of sin (q.v.) does not identify it with the mere mistaken preference of a lesser good. It is a choice in view of obligation and against obligation. It may result in progress as a remote consequence, but it is itself retrogression, fall. Evolution itself provides as fully for degeneration as for progress. There is no warrant in the mere evolutionary process that it will result in unbroken, or even in general advance. And whatever shall be said as to the origin of the race from a single pair, there was certainly a time when men first became true men, in the sense of having then first a developed moral nature. This group of men, larger or smaller, were the true first parents of the race, and correspond to the Adam and Eve of the biblical story. We have only to suppose universal sin among them, certainly a possible supposition since sin is universal now, to get the foundation for consequent disorder of nature in the race; and it will be impossible to disprove the supposition that some one of this group sinned, and that by him all the rest were infected. In some form or other, that supposition is a certainty. On the other hand, evolution powerfully supports the idea of a fall by two of its important contributions to thought. By the emphasis which it lays upon heredity, it provides for the transmission of the disorder with which sin must affect human nature. The slightest change in an organism may affect its entire functioning. The slightest variation tends to be handed down by heredity. Let there be such a change in the spirit as that produced by sin, and under heredity there must be profound consequences introduced into the whole line of descent from such a sinning form. If that be a form, or a group of forms, at the beginning of human history, the principles of evolution would forbid the assignment of limits, and certainly of narrow limits, to the possibility of the resulting harm. Again, the provision for degeneration explains how man should not only sink to a lower level by sin than he would otherwise have maintained, but how sin should result in special cases of marked degeneration, now found in humanity, such as are many of the savage races. Given such a variation from the stock ascending toward man as tends toward an ultimate horse, that varying form has lost forever its possibility of becoming the ancestor of a man. Given sin in man, and sinful man has lost forever the possibility of becoming the ancestor of the ideal man by the ordinary processes of evolution. That is, he is fallen.

The doctrine of the Fall has also been attacked in recent times by schools of critics who have applied evolutionary theories to explain the origin of the biblical books. The tendency has been to reduce the early chapters of Genesis to the category of the mythical, and by thus explaining away the historical character, it has been supposed that the fact of the Fall has also been disproved. But this supposition overlooks the profound psychology of Gen. iii., and does not explain the undeniable fact of universal corruption and sin. Universal sin exists. Underlying it is universal corruption. It must have originated somehow. That origination was the Fall.

FAL′LACY (Lat. *fallacia*, deception, from *fallax*, deceitful, from *fallere*, to deceive; connected with Gk. *σφάλλειν*, *sphallein*, to overthrow, Skt. *phal*, to deceive, Lith. *pùlti*, OHG. *fallan*, Ger. *fallen*, Icel. *fallay*, AS. *feallan*, Eng. *fall*). The incorrect performance of the process of reasoning, so as to lead to error. The science of logic reduces sound reasoning to certain rules, and when any of these rules is violated, a logical fallacy is the result. There has been much discussion as to the proper classification of fallacies, and even now no agreement has been reached. But it is obvious that as a fallacy is a violation of some logical law, an adequate exhibition of the laws of thought will carry with it an adequate exhibition of the possible fallacies. There is only one further difficulty. Language is not a perfect instrument for the expression of thought; and the same kind of logical mistake may be expressed in several ways, and each one of these modes of expression may be important enough to require treatment. This would lead to the old traditional classification into fallacies not complicated by verbal difficulties (*extra dictionem*) and those so complicated (*in dictione*). Those not complicated by verbal difficulties need no detailed treatment, as they are all obvious violations of some logical rule. All that need be done here is to give the names of some of the most common fallacies *extra dictionem*. Thus the fallacy of the *undistributed middle* is a violation of the syllogistic law that the middle term must be distributed at least once. The *illicit process* of the major or minor term is a violation of the syllogistic law that neither extreme (major or minor) must appear in the conclusion with a quantity exceeding that belonging to it in the premises. The *quaternio terminorum*, or *four terms*, violates the law that a syllogism must have three, and only three, terms. The *double negative* violates the law that at least one of the premises of every syllogism that is reduced to proper expression must be affirmative. The *petitio principii*, in the form in which it belongs here, violates the rule that there must be three distinct propositions in a syllogism; the violation occurs when the conclusion to be proved is assumed as a premise. But any really significant *petitio principii* is a fallacy *in dictione*, for it is only when the identity of conclusion and premise is masked that a *petitio principii* is liable to be seriously made or seriously taken. Still another form of the *petitio principii*, called *circulus in probando*, is a fallacy *extra dictionem* which is possible only when there are two or more syllogisms interrelated in such a way that the conclusion of each syllogism is the premise of some other. In this way the conclusion, or what is proved, in one syllogism is used in another syllogism as a basis of proof for a proposition which in its turn ultimately comes to be used as a basis of proof for the first conclusion. Hence the Latin name, meaning a circular process of reasoning. In English this fallacy is often called a *vicious circle*. The term *petitio principii* is sometimes applied to arguments which are not fallacious at all, but which employ as premises propositions the truth of which is not admitted by those to whom the argument is addressed. The fallacy of *the consequent* is a violation of the law that in hypothetical propositions the truth of the apodosis (consequent) is not to be taken as carrying with it the truth of the protasis (antecedent). *Non causa pro causa, post hoc ergo propter hoc*, and *false cause* are names of a fallacy which consists in violating the inductive canon that a temporal antecedent must be distinguished from a cause. The fallacies *in dictione* are not usually classified according to any systematic principle, but names are given to the most frequent or the most subtle of them. A very comprehensive distinction is that between fallacies in which the disguise of the illogical operation is effected by a single word (equivocation), and those in which it is effected by the structure or other peculiarity of a sentence or phrase as a whole (amphiboly). Equivocation or amphiboly, when it appears in the middle term of a syllogism, is called an *ambiguous middle*. If the equivocation arises from misplaced emphasis or accent, it is called the fallacy of *accent*. The so-called fallacies of composition and division may be either equivocations or amphibolies. Thus 'all men' may mean either every man singly (distributive) or the totality of mankind taken as a unit (collective). Any violation of logical rules arising from failure to make this distinction is a fallacy of *composition* when the distributive use is mistaken for the collective; in the reverse case there is a fallacy of *division*. These same fallacies of composition and division are amphibolies when the ambiguity between distributive and collective use lurks not in a single word (as above in the word 'all'), but in a phrase. Thus, from the two premises "The animals walk by two and two," and "Two and two are four," to argue that "The animals walk by fours" is a fallacy of composition arising from an amphiboly. Another way in which a fallacy may arise is from neglect to observe a qualification tacitly but really made. Thus the statement "What I bought yesterday, I ate to-day," in civilized communities really means "What I bought in the marketable form yesterday, I ate to-day after it had undergone whatever change was necessary to make it edible." If now a caviler, refusing to recognize these tacit qualifications, were to say "You bought raw meat yesterday, didn't you?" he would suggest the inference that I ate raw meat to-day. In this case the qualifications really made in the premises are ignored in drawing the conclusion. This is called *argumentum a dicto simpliciter ad dictum secundum quid*—reasoning from statements true in general as if they were true under every qualification.

Another form of fallacy screened by verbal expression is that in which a conclusion is established which in expression resembles the point one starts out to make, but which in reality has nothing to do with that point. This is called *ignoratio elenchi* or *irrelevant conclusion*. The so-called fallacy of *complex question* is nothing but an unwarranted assumption in putting a question. The stock example is the inquiry, "Have you stopped beating your mother?" As can be seen from this brief treatment, many of the fallacies that have time-honored names are not to be taken very seriously. They are relics of an age given to verbal quibbling. It is more important to know what the fundamental laws of thought are, than to know the names given to many trifling and playful violations of such laws. For some other technical terms used to denote improper forms of argumentation, see ARGUMENT. Consult: Sidgwick, *Fallacies* (London, 1888); and the logics of Mill, Creighton, etc. See also LOGIC; INDUCTION; SYLLOGISM.

FALL ARMY-WORM. See GRASS-WORM.

FALLEN TIMBERS, BATTLE OF. See WAYNE, ANTHONY.

FALLFISH. The chub (*Semotilus bullaris*) of the Mississippi Valley. The 'red fallfish' is one of the shiners (*Notropis rubricroceus*), the male of which is "blue with a black lateral band, and the whole body more or less suffused with blood-red." It abounds in the rocky pools of the tumbling mountain streams of the southern Appalachians, and is exceedingly beautiful.

FALLIÈRES, få'lyâr', CLÉMENT ARMAND (1841—). A French legislator. He was born at Mézin, in the Department of Lot-et-Garonne, which he represented in the National Chamber of Deputies from 1876 to 1890. He held the positions of Minister of the Interior in 1882, 1883, and 1887; Minister of Public Instruction in 1883-85 and 1889-90; and Minister of Justice in 1887-88 and 1890-92. He was elected a Senator in 1890 and reëlected in 1897. On the election of Loubet to the Presidency of the Republic in 1899, Fallières succeeded him as president of the Senate, and upon the convening of that body as the high court of justice presided at the trials of M. Déroulède, M. Guérin, and others for conspiracy.

FALLING BODIES. This term is applied to bodies which are unsupported at the surface of the earth, and which under the influence of gravity (see GRAVITATION) fall or move toward its centre. The action follows from the attraction which the earth exerts on matter, and the acceleration which is thus produced is a uniform quantity for any one point—an average value being about 32.2 feet or 981 centimeters per second, though the precise quantity depends on the position on the earth's surface. This quantity it is usual to denote by g; therefore, if we let t represent the time and v the velocity, the velocity produced at the end of any period is $v = gt$. The experimental verification of the laws of falling bodies can be accomplished with the aid of *Atwood's machine;* and under that title will be found a description of the apparatus and its methods of use, together with the results which can be obtained with it. The article GRAVITATION, which gives a complete explanation of the phenomena of freely falling bodies, and also ACCELERATION and MECHANICS, should be read in this connection.

FALLING SICKNESS. See EPILEPSY.

FALLMERAYER, fäl′me-rī′ẽr, JAKOB PHILIPP (1790-1861). A German traveler and historian, born at Tschötsch, in the Tyrol. After studying at Brixen, Salzburg, and Landshut, he was appointed to the chair of history and philology at Landshut. In 1831 he accompanied the Russian general Count Ostermann-Tolstoy in a journey to the East. On returning he resided with this nobleman until 1840 at Geneva, and in the course of the next eight years twice revisited the East. In 1848 he was appointed professor of history in the University of Munich, and for a short time he sat as a Deputy in the Frankfort Parliament, but after 1850 he lived privately in Munich. Fallmerayer was a distinguished polyglot. His opinion concerning the Slavic origin of the modern Greeks, and of their language, excited a great controversy. His principal works are: *Geschichte der Kaisertums Trapezunt* (1831); *Geschichte der Halbinsel Morea im Mittelalter* (1830-36); and *Fragmente aus dem Orient* (1845).

FALL OF THE HOUSE OF USHER, THE. A short story by Edgar Allan Poe, which appeared in the *Gentleman's Magazine* about 1840. One of the most noted of his tales, it is a gruesome mixture of madness, death, and ruin. The hero, Roderick Usher, is found almost deranged with his dying sister. She is buried alive, Usher dies of the shock, and the house falls in ruins during a tempest.

FALLO′PIAN TUBES (so called after Fallopius (q.v.), who is usually, but incorrectly, regarded as their discoverer), or OVIDUCTS. Canals about four or five inches in length in the human body, opening at their inner extremity into the upper angle of the uterus or womb, and at the other end, by a fringed funnel-shaped termination, into the cavity of the peritoneum. This fringed or fimbriated extremity at certain periods grasps the ovary, and receives the ovum, which is discharged by the rupture of the Graafian vesicle. (See OVARIES.) The ovum usually passes along the Fallopian tubes into the uterus, where it is either impregnated by contact with one or more spermatozoa, is absorbed, or escapes with the vaginal mucus. Sometimes, however, the ovum becomes not only impregnated, but retained and further developed, in the Fallopian tubes, thus giving rise to one of the forms of extra-uterine pregnancy.

FALLOPIO, fȧl-lō′pē-ō, or **FALLO′PIUS,** GABRIEL LE (c.1523-62). An Italian anatomist, born at or near Modena. If the date of birth assigned is correct, he was only twenty-five when he was promoted from the University of Ferrara to a professorship at Pisa, whence, after a few years, he was called to Padua, to succeed Vesalius (q.v.), who had been compelled by the Inquisition to resign his office. Tomassini states that Fallopius was born in 1490. He is classed, with Vesalius and Eustachio, as one of the founders of modern anatomy. He was succeeded by his favorite pupil, Fabricius ab Aquapendente.

He published numerous works in various departments of medicine, of which the most important is his *Observationes Anatomicæ, in Libros Quinque Digestæ* (1861), in which he corrects many errors into which his predecessor, Vesalius, had fallen. He was the first to describe with accuracy the ethmoid and sphenoid bones, and the minute structure of the ear (the canal along which the facial nerve passes, after leaving the auditory, is still known as the aqueduct of Fallopius), the muscles of the soft palate, and the villi and valvulæ conniventes of the small intestine. The tubes passing from the ovary on either side to the uterus which bear his name were known to and accurately described by Herophilus and Rufus of Ephesus, 300 years before our era; but Fallopius discovered their function. In addition to his anatomical fame, he had a considerable reputation as a botanist. He was the superintendent of the botanical garden at Padua; and a genus of plants, *Fallopia,* has been named after him. A complete edition of his works, in four folio volumes, was published in 1600.

FALLOUX, fȧ′lōō′, ALFRED FRÉDÉRIC PIERRE, Count de (1811-86). A French author and statesman, born at Angers, in the Department of Maine-et-Loire. Falloux first drew attention to himself by two works characterized by admiration of the old Bourbon régime—*L'histoire de Louis XVI.* (Paris, 1840), and *L'histoire de Saint Pie V.* (Paris, 1884). In the elections of 1846 he was chosen Deputy for the Department of Maine-et-Loire. In politics he was a Legitimist, and a fervent supporter of the Clerical Party. After the revolution of 1848 he urged the abolition of the national workshops, advocated the dispatch of the Papal relief expedition (1849), and as a Minister of Instruction under Louis Napoleon, formulated an educational law, greatly favoring the clergy. After the coup d'état he retired to his estates. He became an Academician in 1856. Between 1866 and 1870 he unsuccessfully sought to reënter politics. After the war with Germany his views became somewhat more liberal; but this cost him the loss of all his friends in the Conservative Party and all his influence. Besides the works already mentioned, he wrote: *Le parti catholique* (Paris, 1856); *Souvenirs de charité* (Paris, 1857); *Madame Swetchine, sa vie et ses œuvres* (Paris, 1860); *La question italienne* (Paris, 1860); *Questions monarchiques* (Paris, 1873). His memoirs were published under the title, *Mémoires d'un royaliste* (Paris, 1887). Consult Venillot, *Le comte de Falloux et ses mémoires* (Paris, 1888).

FALLOW (AS. *fealu,* yellow, Icel. *folr,* OHG. *falo,* Ger. *fahl;* connected with Lat. *pallidus,* pale, Gk. *πολιός, polios,* gray, Skt. *palita,* gray). Waste, untilled land; also land that is plowed, and otherwise stirred, for a season without being cropped. Most of the wheat raised by the Romans was sowed after the land was fallowed; indeed, the usual rotation was fallow and wheat alternately. It was only fertile soils that could long support such an exhausting system; hence resulted the decreasing produce which the later Roman agricultural authors so often speak of and lament.

The fallowing of land was introduced into all the countries which fell under the dominion of the Romans. During their sway, Great Britain exported large quantities of wheat; and for centuries after the Romans left it, no other mode of cultivating the land was followed. It may here be observed that wherever the system of fallowing, without giving manure to the crops, is practiced, it necessarily supposes that the soil is at least moderately fertile. This system is most successful on argillaceous soils, which are retentive of organic manure. It must be borne in mind that the chief use of fallow is to liberate material from which plants may derive their food, and which is already stored up in the soil as organic matter, although the weathering which the soil undergoes assists in rendering the mineral substances it contains more available. The plowing and stirring, by admitting air, promote decomposition and nitrification, and at the same time destroy insects and weeds that impoverish the soil and choke the crops. With improvements in the plow and other tillage implements and the rapid increase in use of manures and fertilizers during the last half-century, the practice of fallowing has been largely abandoned; but it could doubtless be revived with advantage in many cases. For summer fallow, the land should be plowed deeply about the last of May, and the surface put in fine tilth. When the weeds spring up, they should be destroyed by surface tillage. If the land is to be seeded to wheat or rye, the last stirring of the soil should be given not later than the middle of August. The number of plowings and the amount of surface tillage required will depend upon a variety of conditions, but in some cases one deep plowing and one surface tillage will accomplish the desired purpose of destroying the weeds and preparing the soil for the succeeding crop by improving the tilth and increasing the supply of nitrates and other available plant-food. For winter fallow, the land should receive a deep plowing in autumn. Exposure through the winter allows the frost to pulverize the surface. In the spring, when the weather becomes dry, the cultivator or the plow opens up the soil and the process of extirpating the weeds goes on. In old cultivated countries, land is commonly so much reduced in its organic matter that fallows receive dressings of farmyard manure, guano, etc., to increase fertility.

Since the general introduction of green manuring crops, the term fallow has departed somewhat from its original meaning. These crops are sown on what was formerly the fallow, and are styled fallow crops. Green fallow is especially applicable to light, poor soils. It protects the soil from washing and loss of nitrates by leaching, chokes out weeds, improves the tilth, and, if leguminous plants are grown, it enriches the soil in nitrogen gathered from the air by these plants, while some mineral matter is brought to the surface from the subsoil by the roots of the plants. (See GREEN MANURING.) In dry climates, however, green fallow land is more likely to suffer from drought in autumn than is bare fallow. Bastard fallowing is a term applied in Scotland to the practice of plowing hay-stubble at the end of summer, freeing from weeds, and sowing with wheat in autumn. A similar practice, known as short fallow in America, consists in plowing the soil immediately after removing a crop of grain, clover, etc., and keeping the soil well stirred until grain or grass is seeded in the fall. This treatment is very beneficial, and the period is so short that there is not much danger of loss of nitrogen by leaching. Consult: Roberts, *The Fertility of the Land* (New York, 1897); Storer, *Agriculture* (7th ed., New York, 1897).

FALLOW DEER (so called from the dun yellow color). A species of deer (*Dama platyceros*) commonly kept in parks, in most parts of Europe. It is a native of the countries around the Mediterranean, and has been introduced by man into the northern parts of Europe, where it has run wild in some places; it is also wild in Spain, Sardinia, and the Greek islands. How far its geographic range extends eastward is not certainly known. It is represented in the sculptures of Nineveh, but these engravings were probably copied from a different species, the Persian fallow deer (*Cervus Mesopotamicus*). Its introduction into Great Britain has been ascribed to James VI. of Scotland, but it is known to have existed long before his time in Windsor Park. Hundreds of fallow deer now inhabit some of the English parks, where they generally receive some attention and supplies of fodder in winter.

In size, the fallow deer is smaller than the stag or red deer, from which it also differs in its broadly palmated antlers, about 25 inches long, its longer tail, and its smoother and finer hair. In color it is generally yellowish-brown in summer, darker, or even blackish-brown in winter; more or less spotted with pale spots, particularly in summer, and when young. In one variety the spots are very marked; but in another (especially preserved in Epping Forest, near London) they are not to be observed even in the young. The under parts, inside of the limbs, and interior surface of the tail are white, and a dark line passes along the back. When the fallow deer and red deer are kept in the same park, the herds seldom mingle, nor do hybrids occur. The fallow deer loves the woods. Its flesh is one of the most esteemed kinds of venison. The remains of nearly allied fossil species occur in some parts of Europe. Compare SIKA; and see DEER and Plate of FALLOW DEER, MUSK, ETC.

FAL'LOWS, SAMUEL (1835—). An American educator and bishop of the Reformed Episcopal Church. He was born at Pendleton, England, emigrated to America in 1848, and settled in Wisconsin. After his graduation from the University of Wisconsin in 1859, he was appointed professor and vice-president of Galesville University. He served with distinction during the Civil War, entering the army as chaplain of the Third Regiment of Wisconsin Volunteer infantry, September 15, 1862, and leaving it in 1865 as brigadier-general. From 1866 to 1874 he was a regent of the University of Wisconsin, and from 1871 to 1874 was State Superintendent of Public Instruction. He was president of the Illinois Wesleyan University from 1874 to 1875, and in 1875 was made rector of Saint Paul's Reformed Episcopal Church, Chicago. In 1876 he was consecrated bishop of the Church of the West and Northwest jurisdiction, and he was five times presiding bishop of the General Council. His other offices include that of president for nine years of the board of managers of the Illinois State Reformatory, the second largest in the history of its kind in the world; chairman of the general committee on education of the World's Congresses at the Chicago Columbian Exposition; and chancellor of the University Association for Educational Extension. For several years he was editor of the *Appeal*, the first organ of the Reformed Episcopal Church in the West. His principal publications are the following: *Complete Handbook of Abbreviations and Contractions* (1884); *Handbook of Briticisms, Americanisms, Colloquial Words and Phrases* (1883); *Dictionary of Synonyms and Antonyms* (1883-86); *The Home Beyond* (1884); *Progressive Supplemental Dictionary of the English Language* (1886); *Past Noon* (1892); and *Students' Biblical Dictionary* (1901).

FALL RIVER. An important manufacturing city and port of entry in Bristol County, Mass., near the boundary of Rhode Island, at the mouth of the Taunton River, on the eastern shore of Mount Hope Bay, and 50 miles south by west of Boston (Map: Massachusetts, E 4). It is on the New York, New Haven and Hartford Railroad, and is connected by electric railways with cities and towns in the vicinity. Fall River has a safe and deep harbor. The well-known Fall River Boat Line runs to New York, the Windsor Freight Line to Philadelphia, and steamers daily connect with Providence and Newport. The city is about nine miles long, covers 42 square miles, and has many handsome structures of native granite. The most notable buildings are the commodious B. M. C. Durfee High School of granite, the public library, the State armory, and the custom-house and post-office. Among educational and charitable institutions are Notre Dame College, Mount Hope School, the textile school, and the Fall River Conservatory of Music; the Boys' Club, Children's Home and Home for Aged People, City, Union, and Emergency hospitals, and Saint Vincent's and Saint Joseph's homes. Public parks have been laid out in various parts of the city, and there are beautiful drives to the suburbs.

Fall River has abundant water-power derived from Fall River, a stream which rises in Watuppa Lake on the eastern border of the corporate limits, and falls about 130 feet in half a mile. The city has become one of the greatest manufacturing centres of the country, and is noted chiefly for its manufactures of cotton goods, which require over 3,000,000 spindles and 75,000 looms, and represent a large proportion of the total local production. Other manufactures include calico prints, ginghams, woolen goods, men's hats, knit goods, yarn, thread, boots and shoes, spools and bobbins, iron and brass foundry products, machinery, supplies used in cotton-goods manufacturing and bleaching, carriages, rope and twine, rubber, soap, etc. Granite-quarrying also employs a considerable number of men.

The government is vested in a mayor, chosen annually; a bicameral municipal council, the upper and lower houses bearing a numerical ratio of one to three; and subordinate administrative officials. Of these, the school committee is chosen by popular election; overseers of the poor, city physicians, board of health, the reservoir commission, and cemetery and park commission are nominated by the executive, subject to the confirmation of the council; and the water board, trustees of the public library, assessors, board of engineers of the fire department, and all other city officers are elected by the council. Fall River has an excellent system of sewers; is lighted by gas and electricity, the annual cost of street lighting being about $110,000; and owns its water-works, constructed at a cost of $2,000,000, which provide a never-failing supply of pure water from Watuppa Lake. In 1900 the cost of operating the plant was $142,000. The principal items of expense, other than those mentioned, are (approximately) $120,000 for the fire department, $125,000 for charitable institutions, $140,000 for the police department, and $315,000 for schools. The totals of income and expenditure aggregate $3,235,000 and $3,165,000 respectively.

Population, in 1850, 11,524; in 1870, 26,766; in 1890, 74,398; in 1900, 104,863, including 50,000 persons of foreign birth and 300 of negro descent. Fall River was included within the limits of Freetown until 1803, when it was incorporated as a separate town under its present name. It was called Troy from 1804 to 1834, when its old name was restored. In 1854 Fall River was chartered as a city, and in 1862, on the readjustment of the Massachusetts-Rhode Island boundary, a part of the town of Tiverton, R. I., with a population of 3590, was annexed. On July 2, 1843, a disastrous fire destroyed 291 buildings and other property, a total loss of $525,000. Consult Earl, *A Centennial History of Fall River* (New York, 1877).

FALLS CITY. The county-seat of Richardson County, Neb., about 100 miles south of Omaha, on the Missouri Pacific and the Burlington and Missouri River railroads (Map: Nebraska, J 3). It has grain elevators, a large brewery, and manufactures of flour, foundry products, cigars, canned goods, etc. The city maintains a public library which occupies a $10,000 building. The water-works and electric-light plant are owned by the municipality. Population, in 1890, 2102; in 1900, 3022.

FAL'MOUTH. A municipal borough and seaport of Cornwall, England, on a west branch of the estuary of the Fal, 66 miles west-southwest of Plymouth (Map: England, A 6). It consists chiefly of a narrow street, a mile long, on the southwest of the harbor, and of beautiful suburban terraces and villas on the heights behind. The harbor, one of the best in England, whose advantages were first exploited by Sir Walter Raleigh, is formed by the estuary of the Fal. It is defended on the west by Pendennis Castle and on the east by Saint Mawes Castle, both built in the reign of Henry VIII. The docks of Falmouth have an area of over a hundred acres. At one time an important port for the foreign mail-packets, the town is now chiefly known as a watering-place, the bathing being excellent and the climate delightfully mild. It is a busy centre of the pilchard fishery, and has an export and import trade of increasing volume and importance. It exports arms and ammunition, chemical products, tin, copper, and clay. Its chief imports are grain, manures, and timber. It is the seat of a United States consul. The scenery of the Fal, from Truro to Falmouth, is of great beauty. Population, in 1901, 11,800.

FALMOUTH. A city and the county-seat of Pendleton County, Ky., 60 miles north by east of Lexington, on the Licking River, and on the Louisville and Nashville Railroad (Map: Kentucky, G 2). It is in an agricultural section, with a trade in tobacco, grain, and live stock, and has flour, lumber, and woolen mills, a distillery, cannery, etc. Population, in 1890, 1146; in 1900, 1134.

FALMOUTH. A town, including several villages in Barnstable County, Mass., on Vineyard Sound and Buzzard's Bay, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, F 4). It has a fine public library, and is popular as a watering-place. There is a deep and commodious harbor at Woods Hole, where a station with a marine laboratory of the United States Fish Commission is located. Population, in 1890, 2567; in 1900, 3500.

FALSE ACA'CIA. See LOCUST-TREE.

FALSE BAY. An inlet on the southwestern end of Cape Colony, South Africa, situated between the capes of Good Hope and Hangklip (Map: Cape Colony, D 9). It is almost circular in shape and over 22 miles in diameter, and, being remarkably well sheltered by Table Mountain from the northwest monsoon, is used as a station for the British naval forces in South Africa.

FALSE DECRETALS. See PSEUDO-ISIDORIAN DECRETALS.

FALSE FLAX. See CAMELINA; GOLD-OF-PLEASURE.

FALSE IMPRISONMENT. The wrongful violation of the right of personal liberty by detention or restraint of a person without authority of law. While, ordinarily, it takes the form of confinement in a prison, jail, or police station, actual incarceration is not necessary to the offense. Nor is assault or personal violence. It may be committed by words or gestures operating upon the will of a person, so that his liberty of action is illegally limited. A man may be falsely imprisoned in an open street, as when he is accosted by an officer and told that he is a prisoner. But an illegal interference with his right of passage along a highway does not amount to false imprisonment if he is free to proceed by some other way. The victim of false imprisonment may regain his liberty by a writ of habeas corpus (q.v.), and is entitled to damages in an action in tort (q.v.) from the wrongdoer. The wrongdoer is liable to criminal prosecution by *indictment* (q.v.).

The defendant, in a civil or criminal action for false imprisonment, must (after the plaintiff has made out a prima facie case) prove either that the imprisonment was not his act, or that it was justified. He must do more than prove that he did not apply the restraint; he must show that he did not direct, instigate, authorize, or adopt the proceedings connected with the imprisonment. All persons taking part in a false imprisonment, whether instigators, officers, or agents, are liable as joint wrongdoers; although, as in every case of joint tort, the injured party has his option to join all or any number of the wrongdoers in a single action, or to bring separate actions against each. A person is not liable for false imprisonment who does no more than make a complaint to a magistrate or a police officer, if the judge or the policeman thereupon takes independent action.

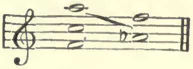
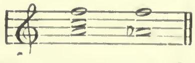
Whether a judicial officer is liable, civilly, for a false imprisonment which he has ordered, depends upon whether he has acted with or without jurisdiction. If he was absolutely without jurisdiction, he is liable; otherwise not, even though he may have acted maliciously. For the corrupt or malicious misconduct of an officer, when acting in a judicial capacity, the only punishment is impeachment or removal from office. An imprisonment by a sheriff, constable, policeman, or similar officer is justified: (1) When made under an apparently regular warrant issued by a judge having apparent jurisdiction of the matter; (2) when made without a judicial warrant, but upon reasonable suspicion of felony, even though a felony has not been committed, or of a person committing a breach of peace in the officer's presence. An imprisonment by a private citizen is justifiable at common law only when made of one committing a breach of the peace in his presence, or of one who he has reasonable cause to believe is guilty of a felony which has been actually committed. These rules of the common law have been modified by modern statutes in many jurisdictions. Consult Stephen, *History of the Criminal Law of England* (London, 1883), and the authorities referred to under TORT, and MALICIOUS PROSECUTION.

FALSEN, fäl'sen, CHRISTIAN MAGNUS (1782-1830). A Norwegian statesman, jurist, and historian. He was born at Oslo, near Christiania, and was educated at the University of Christiania. In 1808 he became circuit judge at Follo, and from that time gave his support to the projected National University. He upheld the new King, Christian Frederick, and after the separation of Norway from Denmark, associated himself with J. G. Adler in draughting the plan of a constitution for Norway, which was modeled upon that adopted by France in 1791. In 1822 he was appointed Attorney-General of the Kingdom, and in 1827 president of the Supreme Court. His principal work is *Norges Historie* (1823-24), a history of Norway to A.D. 1319.

FALSE POINT. A cape, harbor, and lighthouse in the Cuttack District of Orissa, on the Bay of Bengal (Map: India, E 4). The harbor is one of the best on the east coast of India; the anchorage is roomy and completely landlocked. It is a regular port of call for Anglo-Indian coasting steamers. There is a large export trade with Mauritius and other British colonies. It derives its name from frequently being mistaken for Point Palmyras, to the north.

FALSE POSITION, RULE OF. An ancient mode of indirect reckoning, largely superseded by the direct method of equations. The simple equations found in the *Lilivati* of Bhaskara, in the *Liber Quadratorum* of Leonardo of Pisa (see FIBONACCI), and in the works of Tartaglia are solved by this assumption. The method consisted in assuming any number for the unknown quantity, testing its ability to satisfy the given conditions, and finally correcting it by means of a simple proportion; e.g. what number is that whose half exceeds its third by 12? Assume 96 to be the number; 48 — 32 = 16, which is too great; but 16 : 12 = 96 : 72; 72 is the number.

FALSE PRETENSES. In law, willful misrepresentations of fact, whereby a person is induced to part with money or other property to the person making the false statements or to another. By the common law of England, a man is not punishable as a criminal who has induced another, by fraudulent representations, to part with the property of money or goods, unless the loss occasioned by the deception be of a public nature. Larceny or theft was the only species of wrongful abstraction of articles of value which was recognized; and where the consent of the owner to the transaction was obtained, no matter how fraudulently, the loser was left to a civil action for deceit, or to an indictment for the crime of cheating. But neither of these remedies was of sufficient scope to cover all cases of the obtaining of money or other property by false pretenses, and accordingly a statute was passed in the thirty-third year of Henry VIII., whereby it was enacted that if any person should falsely and deceitfully obtain any money, goods, etc., by means of any false token or counterfeit letter made in any other man's name, the offender should suffer any punishment short of death, at the discretion of the judge. This statute, however, only reached the case of deception by use of a false writing or token; the statute 30 Geo. II., c. 24, was therefore passed for the purpose of including all false pretenses whatsoever. Further alterations have been made by subsequent statutes. The general principle is that, wherever a person fraudulently represents as an *existing fact* that which is not an existing fact, and so obtains money or other property from the victim of the deception, he commits an offense within the act. A false representation as to the hopes or expectations of the person making them, as a deceitful calculation of anticipated profits, or the like, is not a violation of the law, however it may mislead the person to whom it is made. The provisions of the statute of Geo. II. have been the basis of legislation on this subject in our States, but the penal statutes of a particular jurisdiction must be examined, if the reader would be certain of the exact state of the law therein on this topic. (See Cheat; Fraud; Larceny.) Consult the authorities referred to under Criminal Law.

FALSE RELATION. In music, the discrepancy arising from the use in successive chords, but in different parts, of any given tone and one of its chromatic derivatives. Thus  is a false relation, but  is correct, since the given tone (a) and its chromatic derivative (a♭) are in the same part. Mozart and Schubert, in pianoforte compositions, frequently used effects of false relation, trusting to the performer to obviate the unpleasantness by emphasizing the chromatic note.

FALSE SWEARING. See Perjury.

FALSET, or FALSETTO. See Voice.

FALSE VERDICT. See Jury.

FALSE WEIGHTS AND MEASURES. See Weights and Measures.

FALSTAFF, fa̤l′stăf, Sir John. A fat, cowardly, boastful character, unsurpassed in literature as a comic portrait. He is represented by Shakespeare in *The Merry Wives of Windsor* as the lover and dupe of Mistress Page; in *Henry IV.* as a soldier and man of wit. It has been supposed that the character was intended to ridicule an English general, Sir John Fastolfe, who at Patay fled before Joan of Arc and was degraded in consequence. In the first draft of *Henry IV.*, Falstaff is called Sir John Oldcastle, the name of a prominent Wiclifite, Lord Cobham, who was put to death under Henry V., the name being subsequently changed in deference to Oldcastle's descendants. The character has also been made the central figure of operas by Dittersdorf (1796), Salieri (1796), Balfe (1838), Nicolai (1849), Adam (1856), Verdi (1892), and others.

FALSTER, făl′stẽr. A Danish island in the Baltic Sea, lying to the south of Zealand, from which it is separated by Masned Sound, and east of Laaland, from which the narrow Guldborg Sound divides it (Map: Denmark, E 4). Area, 183 square miles. Its surface is flat, nowhere exceeding an altitude of 150 feet. It is very fruitful and well cultivated, though the lowest districts are swampy and unhealthful. The inhabitants are chiefly engaged in agriculture and dairying. The chief towns are Nyjöbing, on the Guldborg Sound, and Stubbekjöbing. Population, in 1901, 34,422.

FALSTER, Christian (1690-1752). A Danish poet and philologist, born at Branderslev (island of Laaland). He became rector of the school at Ribe in 1712, and although offered better positions from time to time, refused to give up his rectorship, preferring to live there for his special studies. While in the midst of his work he committed suicide. He published translations of *Ovid* (1719) and *Juvenal* (1731); eleven original satires often reprinted (1720-39); and in Latin a number of works, such as *Vigilia Prima Noctium Ripensium* (1721); *Memoræ Obscuræ* (1722); *Amœnitates Philologicæ* (1721-32).

FALUN, fä′lu̥n. A town of Sweden, in the Län of Kopparberg, situated on the banks of a brook near the northern end of Lake Runn (Map: Sweden, F 6). The city consists of nine ancient villages, and is now regularly built, but is dirty, owing to the adjacent smelting-works. The principal buildings are the Kopparbergs Kyrka—dating from the fourteenth century—with its green copper roof, a town hall, a gymnasium, and a mining school. To the southeast of the city are situated the famous copper-mines of Falun, which are classed among the richest in the world. The machinery is run by water-power. The quantity of copper produced is not as plentiful as formerly, and more attention is paid to the production of vitriol. Silver, sulphur, and gold are also obtained. Population, in 1900, 9606.

FA′MA (Lat., from Gk. *φήμη, phēmē*, Dor. *φάμα, phama*, from *φῆναι, phēnai*, to speak). A personification of Rumor, due apparently in great measure to the Roman poets. Vergil gives a vivid description of Fama, and Ovid describes her palace of bronze. The Roman Fama may be in part derived from a similar personification in Greek, but no such elaborate description of Φήμη has been preserved.

FAMAGUSTA, fä'mȧ-gōō'stȧ, or **FAMAGOSTA.** A seaport on the eastern coast of Cyprus (Map: Turkey in Asia, F 5). It has a fine mosque, formerly a Christian church, while to the north are the ruins of Salamis. Its harbor has been improved under English rule. Population, estimated at 3370 in 1899. Famagusta was built by the Romans of the Empire, probably on the site of the ancient Arsinoë, and was called Fama Augusta. Under Byzantine rule it was an episcopal see, and from the twelfth century was the richest city on the island. The Genoese and Venetians held it in turn, the latter building its strong fortifications. In 1517 it fell into the hands of Turkey.

FAMILIARITY (Lat. *familiaritas*, from *familiaris*, familiar, from *familia*, family, from *famulus*, OLat. *famul*, servant). The traditional view of the process of recognition (q.v.) is rather an expression of a logical postulate than of a psychological analysis of the data furnished by consciousness. It has been assumed that recognition is possible only when the given experience is compared with the memory image of its former occurrence (called forth according to the laws of the association of ideas), and the judgment, "this is like to that," has been passed. Now in most of our recognitions this lengthy process of comparison is not performed. On the contrary, recognition is usually 'immediate,' i.e. the object is at once 'felt' to be familiar or known, without there being present any associative links to 'mediate' the judgment. Admitting this immediacy of recognition, the analytical psychologist seeks to discover whether the 'feeling or recognition,' the sudden glow of familiarity, can be subjected to further analysis, and whether its physiological substrate can be ascertained.

The modern problem of familiarity may be said to have arisen in the course of a controversy between Lehmann and Höffding. Lehmann admits that immediate recognition shows no conscious traces of the progress of association and comparison, but, influenced apparently by the demands of logic, assumes that memory images are always present, and that immediate recognition is complex, based upon a 'subliminal' association, i.e. an association in which the reproduced member is unconscious. Höffding, like Lehmann, approaches the problem of recognition from the facts of association, but goes a step further in saying that in certain cases (cases in which there is no conscious reference to the past; e.g. our recognition of a scent as familiar, although we can neither name it nor recall when or where we have previously smelled it), there is no explicit process of association. The memory image of the previous presentation of the object does not come into consciousness as a free and independent factor: it is merely called up as an 'implicate representation.' The presented object is simply and immediately characterized by a 'quality of knownness.' This 'familiarity' or 'thing-known' consciousness cannot be subjected to further analysis. It is difficult to tell whether Höffding means to explain it in terms of nascent ideas, or in terms of a 'feeling of ease,' 'an increased facility of disposition among nervous elements' which comes with repetition. The former explanation is, of course, much like Lehmann's. The latter calls from Lehmann the objection that it is very doubtful whether ease of molecular movement in the cortex could furnish the substrate for a new conscious quality like that of familiarity. Lehmann furthermore urges that familiarity cannot be based upon a feeling-tone, since simple stimuli, like odors, may be accompanied by quite varied feeling-tones, and yet be equally recognized. This criticism is, however, invalidated if one assumes that the feeling of familiarity is unique.

Those psychologists who, like Külpe and Titchener, recognize two sorts of conscious elements, sensations and affections, and who further subdivide affection into but two qualities, pleasantness and unpleasantness, have before them the task of analyzing the recognitory 'feel' of familiarity into its constituent elements. Külpe says that it is not 'a peculiar attribute' (i.e. an unanalyzable quality of knownness) that stamps ideas as familiar. The real basis of the judgment of familiarity is found: "(1) in the especial effectiveness for central excitation of familiar impressions or memorial images; and (2) in the characteristic mood which they ordinarily induce, and which embraces both pleasurable (or at least comfortable) affective states and the corresponding organic sensations." Titchener says, similarly, that in the recognitory consciousness we have (1) the presented idea; (2) its centrally aroused supplements; and (3) the mood of 'feeling at home.' Immediate recognition may exhibit all degrees of definiteness; e.g. "We pass some one on the street, and I say to my companion: 'I'm sure I know that face.' Here the familiarity mark consists of the word 'known' and the recognitive mood." This position has been criticised by Washburn, who, like Lehmann, doubts the possibility of basing familiarity upon the affective reaction. The mood consists of a pleasantness, plus "a complex of organic sensations, set up by an easy bodily attitude" (Titchener). Now, since there is but one pleasantness, it cannot serve as the specific basis of familiarity; and the organic sensations are not sufficiently definite or uniform to supply the requisite substrate. A recognition may be made with a start of alarm quite in contrast to the easy bodily attitude demanded. This objection seems to have been foreseen; for Titchener says expressly: "Every recognitive consciousness is intrinsically pleasant. Its pleasantness may, however, be outweighed by the unpleasantness of the recognized idea;" i.e. the total experience may be unpleasurable and the pleasantness of the organic sensations of the recognitive mood may be 'forced into the background of consciousness.' But Washburn further urges that the first of Külpe's items, 'effectiveness for central excitation,' implies that a recognized experience tends to call up other processes formerly associated with it. For direct recognition, this means simply calling up the word 'known.' But by what law of association does a repeated experience call up a word that was absent from it at the first occurrence? Direct recognition cannot be explained by the laws of association. The 'knownness' is something more simple. "The consciousness of familiarity . . . is an unanalyzable mental fact." We must simply assume it to be a "peculiar property of centrally excited sensations" whose substrate is "not the actual process in the brain-centres themselves, but the process in which the nervous current is transferred from one brain-centre to another."

For Wundt, the familiarity-consciousness is a 'feeling of recognition' (akin to pleasure, as its opposite, 'unexpectedness,' is akin to pain), due, perhaps, to the greater ease with which the nervous elements respond to a kind of excitation previously experienced. The feeling, however, implies the presence of a background of ideational processes. Consult: Baldwin, *Mental Development in the Child and the Race* (New York, 1895); Höffding, *Vierteljahrsschrift für wissenschaftliche Philosophie,* xiii., xiv. (Leipzig, 1899-90); Külpe, *Outlines of Psychology* (trans. London, 1895); Titchener, *Outlines of Psychology* (New York, 1899).

FAMILIAR SPIRITS. See SOPHIOLOGY; WITCHCRAFT.

FAMILISTS, FAMILY OF LOVE. See AGAPEMONE.

FAMILY (Lat. *familia,* family). The Romans used the word to denote personal property, and further, to denote the descendants of a common progenitor. In our use the word has this last meaning, and also the more especial reference to the group, father, mother, and children. The prevailing idea has long been that the monogamic family was the original type, and that on this all society has been based, other forms being regarded as degenerate. This conception has been accepted since Aristotle, who wrote (*Politics* i. 1) that the original family consisted of the husband and wife and the ox, which last is the slave of the poor man. This patriarchal family was the simplest and earliest form of government and became the model of the monarchy later, the sons with their families standing in coordinate relation to each other under the headship of the father. In Rome the idea of the family was closely connected with the State and the inherent power of the father (*patria potestas*) was the basis of the social and political life. This conception of the family has been called in question in recent years by the investigations of Bachofen, McLennan, Morgan, and their followers. They find evidence that primitive man lived in a condition of promiscuity. Westermarck, Maine, and others deny this. The question is not yet decided. Far too little is known of primitive conditions to make a decision possible. Investigations have shown, however, that among many nations the family, in our sense of the word, can scarcely be said to have existed. Further, many historical nations have legends of the creation of the family. Among advanced nations are customs which seem to point to earlier conditions. The present indications are that monogamy must be considered as the highest form of the family the human race has yet attained. No people is definitely known to have lived entirely on a basis of promiscuity, though some have closely approached it. There are, however, at least three types of families which are distinct. The lowest of these is where the wife is at the head. (See MATRIARCHATE.) Polyandry is common, and descent is reckoned only through the mother. The father is frequently kept at a distance, and sometimes is not even regarded as a blood relative of his own children. A higher form is the patriarchal family, which is almost universally accompanied by polygamy. (See PATRIARCHATE.) This form has been widely extended, and prevails to-day over large sections of the earth. The third form is monogamy.

The life of the monogamic family centres about the home, which has become a social and religious ideal. The early Christians attained this to a considerable degree, but it fell, under the influence of asceticism, not to gain supremacy till after the Reformation. During the Middle Ages the great retinue of a lord was often called his family. The home came into sharp contrast with communal life at the time of the Reformation, and the license of the public festivals but emphasized the need for a change. Since then the home has gained in popular esteem. Its influence in elevating woman, in establishing chastity, in training children, in promoting religion, has given it deserved prominence. Modern charitable efforts seek to further home life. That the home is the best place for the child has become axiomatic. It is this conception of home which has given the modern family such superiority over all others. It seems decided that our civilization will rise or fall with the home. Yet it should be remembered that there are those who from the best motives advocate some scheme of regulated promiscuity. Their views, however, have found little acceptance. In industrial relations the family has been important. In all times it has been the unit of production. Though modern industrialism appears to have changed this, the agricultural pursuits remain in the hands of the family; even inheritance seems to be founded on the idea of coöperation between members of the family. The family has also been a unit of consumption. Economic changes have always had a great, if not a determining, effect upon the family. The transformation of England, for example, into a manufacturing country threatened to destroy the family life. The change from rural to urban conditions has caused great disturbances, and the family is not yet adjusted to the new conditions. The increase of divorce, made easy in the United States by the diversity of State laws, is an indication of the gravity of the changes. (See MARRIAGE.) Consult: Letourneau, *Evolution of Marriage and of the Family* (New York, 1891); Westermarck, *The History of Human Marriage* (London, 1894); Starcke, *The Primitive Family* (New York, 1899); Thwing, *The Family* (Boston, 1887).

FAMILY COMPACT (Fr. *pacte de famille*). The name given to two alliances between the French and Spanish branches of the House of Bourbon in 1733 and 1761, for mutual support against England. In the latter compact the Bourbons of Italy were included. See FRANCE.

FAMINE (OF., Fr. *famine,* from Lat. *fames,* hunger). A general scarcity of food, due as a rule to the failure of crops, and marked by outbreaks of plague and an abnormal rate of mortality. In earlier history it seems to have played a larger part in the woes of mankind than at the present time, though it has not yet been wholly obliterated. The isolation of communities in the early days transformed a temporary local failure of crops into a serious famine. It is not infrequent to read that the inhabitants of one district were gorged with plenty while those of the neighboring region were suffering from starvation. As time has progressed, famines have lost in intensity. This is due principally to the more efficient means of transportation, which permit the distribution of food with greater rapidity than in earlier days. America can now come by direct exportation of food, if need be, to the relief of suffering India. The diversification of industry has been another factor of importance in almost abolishing famines from the more highly developed countries. In such a system of diversified industry, many interests are represented, and while calamity may overtake one or two of them, it is not probable that all will be stricken at the same time. It is, therefore, only the poorer agricultural countries such as Ireland and India, and Eastern countries generally, where the population often depends upon a single staple crop, that have been visited by famines in the latter part of the nineteenth century.

FAMINZIN, fä-mên′tsên. ANDREI SERGEYEVITCH (1835—). A Russian botanist. He was born at Sokolniki, studied at the University of Saint Petersburg, and was appointed professor of botany there. His writings, many of which appeared in the publications of the Saint Petersburg Academy, include *A Study of Cotyledons in the Plant Kingdom* (1876), and *Studies of Crystals and Crystallite* (1884).

FAN. A tribe of fierce cannibals in French Equatorial Africa, differing in color and other bodily characteristics from the true negroes, well known through the explorations of Du Chaillu. They number about 300,000, and have only recently intruded themselves into the Gabun-Ogowé region, pushing forward to the coast. They are coffee-colored, well built, tall and slim, and have rather thin lips, well-developed beard, and short skulls, the frontal bone protruding. Their language is said to belong to the great Bantu family. They are serious and intelligent, and to be depended upon. Their cannibalism has been greatly restricted in later years. See Keane, in Stanford's *Africa* (London, 1895).

FAN (AS. *fann*, from Lat. *vannus*, fan, winnowing machine; connected with Skt. *vā*, Gk. ἀῆναι *aēnai*, to blow, Goth. *winds*, OHG. *wint*, Ger. *Wind*, AS., Eng. *wind*). An instrument or mechanical contrivance for moving the air for the sake of coolness, or for winnowing chaff from grain. In the East, the use of fans is of remote antiquity. The Hebrews, Egyptians, Chinese, and the miscellaneous population of India, all used fans as far back as history reaches. At the present day, it is customary, in the better classes of houses in India, to suspend a large species of fan, known as a punkah, from the ceiling, and keep it in agitation with strings, pulled by servants, in order to give a degree of coolness to the air. Among the oldest notices of winnowing fans are those in the Scriptures. There, the fan is always spoken of as an instrument for driving away chaff, or for cleansing in a metaphorical sense; and such notices remind us of the simple processes of husbandry employed by a people little advanced in the arts. As can be seen from the collection of Egyptian antiquities in the British Museum, the fan as an article of female taste and luxury is of quite as old date as the agricultural instrument. Plautus, the Latin comedian, makes one of his characters speak of the fan as used by ladies. From this Roman usage the fashion of carrying fans could scarcely fail to be handed down to Italy, Spain, and France, whence it was in later times imported by the women of Great Britain. It is proper to say, however, that the fan was in these and also in later times not a mere article of finery. There were walking as well as dress fans. The walking or outdoor fan, which a lady carried with her to church, or to public promenades, was of large dimensions, sufficient to screen the face from the sun, and answered the purpose of the modern parasol. In old prints, ladies are seen carrying these fans in different attitudes according to fancy. The dress fan, which formed part of a lady's equipment at Court ceremonials and fashionable entertainments, was of considerably less size than the walking fan, and altogether more elegant. In the finer kinds of these old fans, the open part of paper is painted with pretty rural scenes and groups of figures in the style of Watteau (q.v.). All were probably of French manufacture. The more costly fan imported from China was altogether of ivory, highly carved and pierced; but it lacked the lightness and flexibility which were essential in the ordinary management of this article of the toilet. Strictly speaking, the fan was used less for the purposes of cooling than for giving the hands something to do, and also for symbolically expressing certain passing feelings.

Fans are of two kinds, those that are rigid and those that will fold. Of the former, simpler kind the modern palm-leaf fan imported from the East or West Indies is a typical example, although fans of many other materials are made in the same general form. The folding fan is said to have been a Japanese invention of the seventh century, and this country still supplies the Western world with a large part of its cheaper fans. The folding fan consists of two portions, the folded fabric and the rigid strips fastened to it and pivoted together at the other end so that they fold easily. In Japan fan-making is partly a household industry, and even the cheapest and simplest fan passes through many fingers during the course of its construction. The bamboo ribs are cut by one set of workers, the designs for the fabric made by a second, and the printing by a third. The printed sheets and bamboo strips are now given to workmen, who first fold the sheets by putting them between two sheets of heavily oiled paper which are properly creased, and then putting them under pressure. The sheets are then spread with paste, the strips applied and then pivoted. A designer plans and directs every step of the process, deciding upon shape, design, and coloring. Modern fans are made of an endless variety of materials, including all the finer textiles, feathers, paper, ivory, and woods. Great opportunity for the display of taste and artistic ability is afforded in the design and fabrication of fans.

FAN, or FANNER. In agriculture, a machine employed to winnow grain. In passing through the machine, the grain is rapidly agitated in a sieve, and, falling through a strong current of wind created by a rotary fan, the chaff is blown out, the cleansed grain falling out at an orifice beneath. The apparatus is composed chiefly of wood, and though ordinarily moved by the hand, it is sometimes connected with the driving power of a threshing-machine. The fan superseded the old and slow process of winnowing, which consisted in throwing up the grain by means of sieves or shovels, while a current of wind, blowing across the threshing-floor, carried away the chaff. It is said that a machine for the winnowing of grain was for the first time made in Scotland, by Andrew Rodger, a farmer, on the estate of Cavers, in Roxburghshire, in the year 1737. See IMPLEMENTS, AGRICULTURAL.

FANA′RIOTS. To the Greeks who assisted him in obtaining an entrance to Constantinople after his ships had been transported overland to the Golden Horn, Mohammed II. granted the Fanar quarter of the city, on the Golden Horn adjoining the Blacherne. The district was so called from the lighthouse that stood on the promontory jutting from it into the Golden Horn. The district is described by Grosvenor as "prosperous, cleanly, and well-kept," and Theophile Gautier says of it, "Hither has fled ancient Byzantium." Its Greek inhabitants, many of them descendants of the oldest and noblest Byzantine families, were known as Fanariots, and came to be a special class in the Ottoman Empire, recruited by emigrants from different parts of the old Byzantine Empire. Subtle, insinuating, intriguing, they soon took advantage of the ignorance of the Turkish governors, and made themselves politically indispensable to their rulers. They filled the offices of dragomans, secretaries, bankers, etc. Through their influence the lucrative office of dragoman of the fleet was called into existence, which gave them almost unlimited power in the islands of the Archipelago. From them were chosen, until the outbreak of the Revolution, in 1821, the hospodars of Wallachia and Moldavia, while in addition the disposal of most of the civil and military posts under the Turkish Government was in their hands. In spite of their power, however, they never exhibited much patriotism; they were animated by the petty motives of a caste, and when the War of Liberation broke out among their countrymen, the part they took in it, though fairly important, was not what their station and their wealth should have contributed to the patriot cause. In the present altered state of affairs in Turkey they have no political influence. Consult: Tennent, *History of Modern Greece* (2 vols., London, 1845); Samuelson, *Roumania* (London, 1882).

FAN-CHENG, făn′chĕng′. A town in the Province of Hu-peh, China, situated on the Han-kiang, 162 miles northwest of Hankow (Map: China, D 5). It is an important commercial centre on account of its position on the trade routes between southern and northern China. The population is estimated at 100,000.

FAN CORAL. A flat, spreading coralline growth, usually one of the Alcyonaria (q.v.).

FANDANGO, *Sp. pron.* fȧn-dȧṉ′gō̇ (Sp., from the African name). One of the three national dances of Spain, the others being the bolero (q.v.) and the seguidilla (q.v.). It is probably the oldest Spanish dance and the prototype of all the other forms. It is mentioned frequently in the literature of the sixteenth century, when it seems to have first attained a national importance. The time of the dance is $\frac{6}{8}$, but the figures are very lively, and the music is supplied by castanets in the hands of the performers, a man and a woman, and by a song which is accompanied on the guitar. When one couple is tired another immediately takes its place, and the music and the dance go on as before, with no interruption.

FANEUIL, făn′el *or* fŭn′el, PETER (1700-43). An American merchant. He was born in New Rochelle, N. Y. The family removed to Boston shortly after his birth, and there established an extensive mercantile business, of which in time he became the proprietor. In 1740 Peter Faneuil constructed Faneuil Hall (q.v.), at his own expense, and presented it to the town. The building was completed in the fall of 1742, the first public use to which it was put being the memorial exercise to its donor, who died in May, 1743.

FANEUIL HALL. A market-house and public hall in Boston, Mass. The original building, begun in 1740 and completed in 1742, was erected by Peter Faneuil (q.v.), and presented by him to the town. It was almost completely destroyed in 1761, and in 1763 was rebuilt by the town. During and preceding the Revolution it was so frequently used for important political meetings that it became known as 'The Cradle of American Liberty.' In 1805 it was enlarged to its present size, 80 by 100 feet, and an additional story was added. The hall contains some fine paintings, the most celebrated of which is "Webster Replying to Hayne," by Healy, and meetings are still held in it. The basement is still used as a market. Consult Brown, *Faneuil Hall and Market* (Boston, 1901).

FAN′FARE (Fr., from Sp. *fanfarria*, fanfare, from OSp. *fanfa*, bluster; probably from Ar. *farfār*, blustering, from *farfara*, to agitate). A trumpet-signal which employs the tones of the triad and generally closes on the dominant. It is often used to introduce marches (*Tannhäuser*, *Atalie*, etc.). Famous fanfares are, that in Beethoven's *Fidelio* announcing the arrival of the governor, and ending on the tonic, and the more extended ones in Wagner's *Lohengrin*, *Tristan*, and *Meistersinger*.

FANG, MR. A brutal police magistrate in Dickens's *Oliver Twist*, a portrait of Justice Laing, a police magistrate of the time, who was removed from office in consequence of the exposure.

FAN′ING, EATON (1850—). An English composer and conductor, born at Helston, Cornwall. He was educated at the Royal Academy of Music, under such masters as Bennett and Steggall. In 1873 he won the Mendelssohn scholarship, one of the greatest of English musical prizes, and also was awarded the Lucas Medal in 1876. He took the degree of musical bachelor at Cambridge in 1894. In 1885 he became the director of music at Harrow School. His published works include many successful part songs and choruses, the operas *The Two Majors* (1877), *Mock Turtle* (1881), *The Head of the Poll* (1882), and a dramatic cantata, *Liberty* (1882).

FANNIÈRE, fȧ′nyâr′, FRANÇOIS AUGUSTE (1818—), and FRANÇOIS JOSEPH LOUIS (1822—). French goldsmiths and chiselers, brothers, born at Longwy, Moselle. The elder was a pupil of Drolling at the Ecole des Beaux-Arts: They excelled in the goldsmith's art, and their work in elaboration and delicacy is compared to that done in Renaissance times. Among their masterpieces are two shields, one representing incidents from *Orlando Furioso,* and the other "Flora." Auguste was a member of the Legion of Honor.

FAN'NIN, James W. (c.1800-36). An American soldier. He was born in Georgia, and removed to Texas in 1834. In the Texan War of Independence he raised a company known as the 'Brazos Volunteers,' which formed part of General Austin's army. After the fall of the Alamo, Fannin received orders from Houston to blow up the fort at Goliad and fall back to Victoria. He delayed his retreat for some time in order to collect the women and children of the neighborhood, and finally setting out 350 strong, was overtaken and attacked, on March 19, 1836, on the banks of Coleto Creek, by General Urrea and 1200 Mexican troops. After a two days' battle, in which the Mexicans lost between 300 and 400 in killed and wounded, and the Texans only about 70, Fannin surrendered, on the condition that his troops should be paroled. Instead of being freed, they were taken back to Goliad as prisoners, where, on March 27th, in accordance with orders from Santa Anna, in the absence of General Urrea, they were all shot down in cold blood, with the exception of two surgeons, the women, and a few men who escaped after being fired upon.

FAN'NING, Edmund (1737-1818). An American soldier, prominent as a partisan leader on the side of the Loyalists during the Revolutionary War. He was born on Long Island, N. Y., graduated at Yale in 1757, and soon afterwards removed to Hillsborough, N. C., where he practiced law, held various positions of minor importance, and was elected to the Legislature of the Colony. As recorder of deeds for Orange County, he made himself exceedingly unpopular with the colonists, and was charged with having, by his abuses and his vicious administration, done much to cause the uprising of the Regulators, who virtually drove him from North Carolina. He acted for a time as private secretary to his father-in-law, Governor Tryon (q.v.), in New York, and in 1774 was appointed Surveyor-General by the British Government. In 1777 he organized in New York a corps of 460 Loyalists, which, under the name 'Associated Loyalists,' or the 'King's American Regiment,' took an active part in the partisan warfare in the Northern Department. A short time before the close of the war he removed to Nova Scotia, where in 1783 he became a Councilor and Lieutenant-Governor, and subsequently was Lieutenant-Governor of the island of Saint John from 1787 to 1799, and of Prince Edward Island from 1799 to 1804. By successive promotions he became a lieutenant-general in the British Army in 1799, and a general in 1808.

FANNING, John Thomas (1837—). An American civil and hydraulic engineer. He was born at Norwich, Conn., and received an academic education. He served in a Connecticut regiment in the Civil War, and attained the rank of lieutenant-colonel. As an engineer he planned many public water-works in various parts of New England. In 1885 he made a report on the improvement of hydraulic power on the Mississippi River at Minneapolis, Minn., and in the following year was appointed chief engineer of the Saint Anthony Falls Water-Power Company. He prepared a comprehensive plan for the drainage of 3000 square miles of the hard-wheat land in the valley of the Red River of the North, and constructed the great dam, the public water-works, and the electric-light plant of Austin, Tex. The large water-powers on the Missouri River, at Great Falls and Helena, Mont., on the Spokane River, at Spokane, Wash., were also developed by Fanning. He was also associated as consulting engineer with several of the leading railroad companies of the West. His principal publication is *A Treatise on Hydraulic and Water Supply Engineering* (14th ed. 1899).

FANNING ISLANDS (named from Edmund Fanning, who discovered the islands in 1798). A group of small islands in the Pacific, scattered about a segment of the equator, lying between longitudes 157° and 163° W. (Map: World, J 5). The area of the group is about 260 square miles, and the chief islands are Christmas, Fanning, Jarvis, Washington, and Palmyra. Since 1888 they have belonged to Great Britain. The population is estimated at 200.

FAN'NIUS STRABO, Gaius. A Roman historian and orator, introduced by Cicero as one of the speakers in his works, *De Amicitia* and *De Republica.* He was a son-in-law of Lælius. During the Third Punic War he served in Africa under Scipio Africanus (B.C. 149-46), and, according to his own statement, as preserved by Plutarch (*Tib. Gracch.,* 4), was one of the first to mount the walls of Carthage in the capture of that city. He owed his celebrity in literature chiefly to his *History,* which treated of contemporary events, and was one of the earliest histories written in Latin. Cicero mentions an abridgment of it by M. Brutus. For the extant fragments, consult: Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883); Gerlach, *Geschichtschreiber der Römer* (Stuttgart, 1855); and Hirschfeld, "Die Annales des Cicero Fannius," in *Wiener Studien* (Vienna, 1879). This Fannius is frequently confounded with C. Fannius Strabo, who was consul in B.C. 122.

FANNY. The heroine of Fielding's novel *Joseph Andrews.* She is a maid-servant, the sweetheart of the title character, and accompanies him in his adventurous journeys along English highways.

FANNY, Lord. A nickname given to John, Baron Hervey, because of his affected manners.

FANO, fä'nō (Lat. *Fanum Fortunæ,* from the temple of Fortune erected here by the Romans to commemorate the defeat of Hasdrubal, q.v.). A city in the Province of Pesaro e Urbino, Italy, on the Adriatic, 29 miles northwest of Ancona (Map: Italy, H 4). It is surrounded by ancient walls and a moat, and a modern statue of Fortune on the public fountain indicates the origin of the name. The sea bathing is excellent, but as the once famous harbor is choked with mud and sand, the shipping is conducted through a canal leading from the Metauro to the Adriatic. The Cathedral of San Fortunato has a thirteenth-century portal, a chapel with frescoes by Domenichino, and a Madonna with two saints by Carracci. In other churches are an enthroned Madonna (1497) by Perugino, a Madonna by Giovanni Santi, an Annunciation by Guido Reni, frescoes by Viviani, and "Sant' Angelo Custode," by Guercino, which is the subject of Robert Browning's "The Guardian Angel." The Arch of Augustus has a second story, added in honor of Constantine, to whom it was rededicated in the fourth century. Fano has a lyceum, a gymnasium, an orphan asylum, an industrial school, and a once famous theatre, and is a centre of silk and fishing industries. Clement VIII. was born here in 1536, and in 1514 the first printing-press with Arabic type was set up here at the cost of Julius II. Population, in 1901 (commune), 24,848.

FAN PALM. A loose term applied to certain species of palm, distinguished from the pinnate-leaved species, such as the date (Phœnix), by having fan-like leaves. Among the commoner fan palms are various species of Corypha, Chamærops, Sabal, and Trachycarpus.

FANSAGA, fȧn-sä′gȧ, Cosimo (1591-1678). An Italian painter, sculptor, and architect, born in Bergamo. He was the pupil of Pietro Bernini in Rome, and lived chiefly in Naples. His numerous works in that city include the Fountain of Medina, the Cloister and Refectory of San Severino, the façade of Santa Teresa delli Scalzi and of Saint Francis Xavier, and the two obelisks of Saint Januarius and Saint Dominic. Although certain of his own works are effective, despite their overloading of ornament and bizarre combinations, his pupils and followers only carried on his exaggerations.

FAN′SHAWE. A novel by Nathaniel Hawthorne, the author's maiden effort, published anonymously in 1826 at his own expense. It failed to attract attention and he suppressed it afterwards, yet it forms part of the late editions of his works.

FANSHAWE, Sir Richard (1608-66). An English diplomat and author, born in Hertfordshire. He entered Jesus College, Cambridge, and in 1626 began the study of law in the Inner Temple. He spent several years in travel upon the Continent, and in 1635 he began his diplomatic career, accompanying Lord Aston, the English Ambassador, to Spain as his secretary. He was a zealous Royalist, and joined the army of Charles I. early in the Civil War. In 1648 he became treasurer of the navy under Prince Rupert, and afterwards joined Prince Charles in Holland. His early service in Madrid procured him the position of special envoy to the King of Spain in 1650, for the purpose of obtaining pecuniary aid for the royal cause, but his mission was unsuccessful. He followed Prince Charles to Scotland as his secretary, and was with him at the battle of Worcester (September 3, 1651), where he was taken prisoner. He was released on parole and remained in England until 1658, when he again joined Charles II. on the Continent, returning with him at the Restoration. In 1662 he was made Minister to Portugal, and in 1663 was transferred to Madrid, but was recalled in 1666. He never left Madrid, as he was taken ill and died a few days after turning over his position to his successor, Lord Sandwich.

The literary work of Fanshawe consists largely of translations and poetry. Probably his best-known work is *The Pastor Fido* (1647), a translation from the Italian of Guarini. His other writings include a translation in Spenserian stanzas of Vergil's *Æneid*, book iv.; a translation of the *Odes of Horace* (1652); *The Lusiad* (1665), an historical poem, translated from the Portuguese of Camoëns; *La Fida Pastora* (1658), a translation into Latin verse of Fletcher's *Faithful Shepherdess;* and *Querer por solo querer* (1671), a dramatic romance in three acts, from the Spanish. He was the author of some original English poems of considerable merit, which have never been published together. His *Letters* were collected and published in 1702. Consult the *Memoir* by his wife (London, 1829).

FAN-SHELL. A scallop (Pecten); so called from its shape and radiating ridges.

FANTAIL. (1) A breed of domestic doves. See Pigeon, and Plate of Pigeons. (2) One of the small fly-catchers of India and Australasia, of the genus Rhipidura. These have long tails of loose feathers, which they 'fan out' prettily by a sidewise flirting movement as they dodge about in pursuit of insects. They are familiars of every rural garden, sing much at night, and build exquisite nests. Some 50 species are known, scattered from New Zealand to the Himalayas. (3) A warbler (*Cisticola schœnicola*) of the Mediterranean basin, remarkable for the beautiful nest it builds in the form of a basket attached to upright stalks of grass, and filled with a cup of cottony material, and for the great variety in the coloring of its eggs.

The term 'fan-tailed' has been used by systemists as a name for all birds except Archæopteryx, that is the Euornithes (q.v.), because the concentration of the caudal vertebræ into a pygostyle gives the tail-feathers a typically fan-like shape; hence Dr. Theodore Gill's term Eurhipiduræ, as an equivalent of Euornithes.

FAN′TAN (Chinese *fan*, number of times + *tan*, apportion). A gambling game, very popular in China. In the American game a pack of 52 cards is used. The deal starts by cutting the cards. Ace high deals. The cards are then dealt to the left, one at a time. As many as eight persons may play. The cards remaining at the finish of the deal are dealt face down to the centre of the table. The first player at the left of the dealer must have an ace to play, in which event he plays the ace to the centre of the table. Having no ace, he must ante the amount agreed upon (usually 5 cents or less) to the centre of the table, and draw one of the remaining cards. Thus the game proceeds until an ace can be played, after which the different stacks of cards are built up consecutively to the king. The first player ridding himself of his cards wins the pot. Failure to play a card in turn is punished by a fine equal to the amount of the ante for every card remaining in all of the players' hands.

FANTASIA, *It. pron.* fȧn′tȧ-zē′ȧ (It., fancy). (1) In music, a composition somewhat free in form, as opposed to the strict form of the fugue or sonata. (2) An improvisation (q.v.). (3) The fantasia, also free fantasia, that part of a movement in sonata form which follows the first or exposition section. It is also called 'development section,' because the themes used in the first section are here more fully developed. (See Sonata.) (4) In the seventeenth and eighteenth centuries the term fantasia was applied to a composition in which a theme was developed in free imitation (q.v.).

FANTI, or **FANTEE,** fȧn-tē′ *or* făn′tē. Formerly a separate African State, now a part of the British Gold Coast Colony, situated on the coast south of Ashanti. The Fantis, who are closely allied to the Ashantis, waged incessant wars against the latter until subjugated in the beginning of the nineteenth century. See Ashanti.

FANTI, fän'tê, Manfredo (1808-65). An Italian general. He was born at Carpi, near Modena. In 1831 he took part in the rising against the Duke of Modena and the Austrians; in 1835 he entered the Spanish service, where he was distinguished by his bravery in the Carlist War, and was promoted to the rank of colonel on the General Staff at Madrid. Upon the outbreak of the Revolution of 1848 he returned to Italy, where in the following year he fought against the Austrians. During the Crimean War he served as general of division, and in the war of 1859 commanded the forces of the provisional governments of Tuscany, Modena, the Romagna, and Parma. In 1860 he entered the first Italian Cabinet of Cavour as head of the Ministry of War, in which capacity he increased the army and brilliantly conducted the campaign against the Papal troops in Umbria. As chief of general staff to Victor Emmanuel, he reduced Gaeta and Mola. In 1872 a bronze statue was erected to his memory in Florence.

FANTINE, fäɴ'tēn'. The mother of Cosette, in Victor Hugo's *Les Misérables.* She gives her name to part i. of the novel.

FANTIN-LATOUR, fäɴ'täɴ' lȧ'to͞or', Henri (1836—). A French painter, born at Grenoble. He was the son and pupil of Theodore Fantin-Latour (1805-75), and studied in Paris under Lecoq de Boisbaudran. His painting is refined, simple, and harmonious, and excellent in color. His chief works are portraits of "M. Jullien" and "M. and Madame Edwards" (1875); "The Reader;" "The Temptation of Saint Anthony;" the "Prelude to Lohengrin;" and "Homage to Delacroix." His numerous lithographs treat subjects taken from Wagner, or are inspired by the themes of Berlioz or Schumann. He also painted flowers and still life with much delicacy. He received medals in 1870 and 1875, and the cross of the Legion of Honor in 1879.

FAN-TRACERY VAULTING. A kind of late Gothic vaulting peculiar to the Perdendicular (q.v.) style in England. It is the logical outcome of the English feeling that the ribs of Gothic vaulting were not strictly structural elements, as is the case in all pure Gothic, especially in France (see Vaulting), but could be used for decorating the surface of the vaults without regard to functional use, as a form of surface tracery. The first step consisted in supplementing the two diagonal ribs of the simple quadripartite vault by other ribs radiating, at equal distances, from the same point—namely, the spring of the vault, on the wall or over the capital of the pier. These gave four fan-like groups of ribs, called *tiercerons,* whose summits were intercepted at the ridge-level by other ribs, called *liernes.* This is the simple *fan vaulting,* as in the chapter-house at Wells (1292) and the choir of Exeter. When, during the fourteenth century, other ribs, parallel to the *lierne* ridge ribs, were added, which were crossed by the *tiercerons,* a series of star-shaped groups were formed, and these were called *lierne* or *star* vaults, as in the nave of Tewkesbury and the choir of Gloucester. This was popular during the Decorated style (q.v.). With the advent of the Perpendicular, the whole surface of the vaulting between the ribs was filled with a rich tracery, similar to that used in windows, and consisting of cusped arcades, circles, or polygons of bewildering delicacy. Thus the *fan-tracery vaulting* was finally created. Its most wonderful novelty was the construction of stone pendants hanging from the vaulting surfaces and supported by an ingenious series of internal arches, while appearing to rest on air. Among the finest examples are Henry VII.'s chapel at Westminster, Saint George's at Windsor, and King's College Chapel at Cambridge. This vaulting was also used in cloisters, as at Gloucester and Canterbury. Consult: Gwilt, *Encyclopædia of Architecture,* revised by Papworth (London, 1867); Willis, "Construction of the Vaults of the Middle Age," in *Transactions of the Royal Institute of British Architects* (London, 1842).

FARABI, fȧ-rä'bê. See Al-Farabi.

FAR'AD. The farad is the so-called 'practical' unit of electric capacity, being by definition the capacity of a condenser whose potential is one volt when charged by one coulomb. It is substantially equal to the C. G. S. electro-magnetic unit of capacity, divided by 10^9, or to the C. G. S. electrostatic unit of capacity, multiplied by 9×10^{11}. One-millionth of a farad is called a 'microfarad.' The name 'farad' was given the unit of capacity in honor of Michael Faraday, who made such important discoveries in regard to the nature of the capacity of condensers. See Electrical Units.

FAR'ADAY, Michael (1791-1867). A distinguished English chemist and physicist. He was born near London, the son of a blacksmith, and at an early age was apprenticed to a bookbinder. He devoted his leisure time to science, and, among other things, made experiments with an electrical machine of his own construction. In 1812 he was able to attend the chemical lectures of Sir H. Davy (q.v.), then at the zenith of his fame, and he ventured to send to Davy the notes he had taken, with a modest expression of his desire to be employed in some intellectual pursuit. Davy engaged him as his assistant at the Royal Institution, and later took him to the Continent as assistant and amanuensis. On their return to London Davy confided to him the performance of a number of important experiments, which led in his hands to the liquefaction of certain gases by pressure. Here he showed that extraordinary power and ingenuity which resulted in so many important discoveries, and rendered his name familiar to every student of physics. In 1824 he was elected to the Royal Society, and in the following year was appointed director of the laboratory of the Royal Institution, where later he was promoted to Davy's post of professor of chemistry. Faraday's first important discovery was the revolution of a magnetic needle around an electric current (1821), and ten years later came his work on magneto-electricity and induction. Following this came the discovery of the action of one current on another, when the deflection was observed as before, and also when a magnet was inserted or withdrawn in a coil of wire. These discoveries naturally furnished the foundation for the development of magneto and dynamo machines, and other inventions of importance. Faraday's researches in electrolysis are also of great value, and to him is due the discovery that the amount of liquid decomposed is proportioned to the current passing through the solution, and that equal quantities of electricity decompose equivalent amounts of different electrolytes. To him we owe the terms 'anode' and 'cathode.' He was also the discoverer of 'specific inductive capacity,' or the measure of the electric attraction and repulsion exerted through various dielectrics or insulating substances. According to Faraday, both electrostatic and electro-magnetic induction takes place along curved lines, which he denominated 'lines of force.' Faraday discovered that the plane of vibration of a beam of polarized light is rotated under the influence of a powerful magnetic field. The phenomena of diamagnetism, or the repulsion of certain substances, were also carefully investigated by Faraday, and many valuable results obtained. In chemistry, also, where most of Faraday's early work was done, many important discoveries are to be recorded, including a number of new chemical compounds. Of these perhaps the most important is an investigation on new compounds of carbon and hydrogen (*Philosophical Transactions*, 1825), inasmuch as it included the discovery of benzol, which is the basis of aniline dyes. He also carried on a number of experiments looking to the production of optical glass with unusual power of refraction; but while glass with an index of refraction of 1.866 was made, it did not prove available, on account of its softness.

Faraday was one of the most brilliant experimentalists that science has ever known, and to him credit must be given for much that electricity has accomplished. The experimental work that he had done with such care furnished a basis for the mathematical and theoretical discussions of Maxwell, and his *Experimental Researches in Electricity* (1839-55) contains a complete record of his investigations. In 1835 Faraday received a pension of £300 a year for the rest of his life, and in 1836 he became the scientific adviser of Trinity House. By royal grant he occupied a house at Hampton Court. He was invited to become the president of the Royal Society, but declined the honor.

Faraday was a deeply religious man, belonging to a small sect of Christians known as Sandemanians, and was generous and sympathetic to a high degree. His last years were marked by failing powers of mind and body, yet in spite of this some of his best work was accomplished shortly before his death. In addition to the *Experimental Researches in Electricity* (1839-55), he published *Researches in Chemistry and Physics* (1859), and many papers in the *Proceedings of the Royal Institution* and the *Philosophical Magazine*. For his life and work, consult: Jones, *Life and Letters of Faraday* (London, 1870); Tyndall, *Faraday as a Discoverer* (2d ed., London, 1870); and Thompson, *Michael Faraday: His Life and Work* (London, 1898).

FARADAY EFFECT. See Electricity, and Light.

FARADAY TUBES. See Electricity.

FAR′ADISM. See Electricity, Medical Uses of.

FARALLONES (fä′rȧ-lōnz′) **ISLANDS.** A group of six small, rocky islands off the coast of California, about 35 miles directly west of San Francisco. Their extreme points—northwest and southeast—are about 12 miles apart. On the southernmost island stands an important lighthouse, having a flashing light of the first order, 360 feet above the sea. The Farallones are the resort of myriads of sea-gulls and murres, whose eggs are collected in large quantities for the San Francisco market by a company which owns the islands. Great numbers of sea-lions and rabbits are also found.

FARANDOLE, fȧ′räN′dôl′. A popular dance of southern France, where it has been in vogue for hundreds of years. A leader, who must always be a bachelor, holds out a handkerchief to his partner, who takes hold of it and extends her own to another man, who in turn gives his to his partner, and so on indefinitely, the number of performers having practically no limit. Whatever motions the leader makes must be imitated by the other dancers, and the long line winds, coils round on itself, and again straightens out, according to the leader's pleasure. The time is rapid, and the music is supplied by a fife and drum. The farandole is essentially a dance of rejoicing over family affairs, and when held at night is extremely picturesque, as each performer carries a Venetian lantern. There is a vivid description of a farandole which Daudet saw in the amphitheatre of Aps, in Provence, in his book *Numa Roumestan.*

FARCE (Fr. *farce*, from Lat. *farsus*, p.p. of *farcire*, to stuff). A dramatic piece of a grotesquely comic character. The difference between it and regular comedy is more in degree than in kind. Both aim to excite laughter, but while legitimate comedy does so with a comparatively faithful adherence to nature and truth, the farce assumes to itself a much greater license, and does not scruple to make use of any extravagance or any improbability that may serve its usually very simple plot. Instead of refined wit or humor it substitutes broad absurdities. Broadly speaking, farcical elements have entered into many of the forms of primitive comedy. Thus, both in the significance of the word and the kind of 'stuffing' it denotes, farce would seem to bear an analogy to the early Latin *saturæ*, while the popular *commedia dell' arte* of a much later day in Italy were of a somewhat similar character. The name *farce*, however, seems to have been first applied in its present sense particularly to the pieces produced by the French society of the *clercs de bazoche* as a contrast to the *moralities* played by the religious orders. They have been confounded in their origin with the *sermons joyeux*, or parodies on the ritual of the Church. A characteristic of many of the farces was a mixture of dialects. In one scene of the *Farce de Pathelin*, the principal personage speaks seven or eight. This most famous of all the farces has been attributed to different authors, most commonly to Pierre Blanchet, one of the *Bazoche* in the fifteenth century, and even to the poet Villon. At a later date, Molière elevated and refined mediæval farce into pure comedy in his *Médecin malgré lui*, *Les précieuses ridicules*, and other inimitable productions. In England, the farce came about the beginning of the eighteenth century to be regarded as something distinct from comedy proper and to constitute a special form of composition. Out of the numerous farces which have been performed before English-speaking audiences, those of Samuel Foote especially have kept a place in literature. On the stage at the present day, the name farce, or sometimes the vulgarism 'farce comedy,' is freely applied to

MICHAEL FARADAY
FROM A PAINTING BY JOHN PHILLIP

almost any light piece in which the comic goes to preposterous lengths.

Consult: Petit de Julleville, *La comédie et les mœurs en France au moyen âge* (Paris, 1886); and *Répertoire du théâtre comique en France au moyen âge* (Paris, 1886); Inchbald, *A Collection of Farces and Other Afterpieces* (London, 1815).

FARCY. See GLANDERS.

FARDEL-BOUND (OF. *fardel*, burden, Sp., Port. *fardel*, diminutive of *fardo*, pack, from Ar. *fardat*, bundle of merchandise + *bound*). A disease of cattle and sheep, characterized by impaction of the fardel-bag, or third stomach, with food, which is taken in between the leaves of this globular stomach, there to be fully softened and reduced. When the food is unusually tough, dry, or indigestible, consisting, for example, of overripe clover, vetch, or rye-grass, the stomach cannot moisten and reduce it with sufficient rapidity; fresh quantities continue to be taken in, until the overgorged organ becomes paralyzed, its secretions dried up, and its leaves affected with chronic inflammation. The slighter cases, so common among stall-fed cattle, are 'loss of cud,' indigestion, and torpidity of the bowels. In severer form there are also fever, grunting, bloating of the first stomach, and sometimes stupor or epilepsy. The overgorged stomach can, moreover, be felt by pressing the closed fist upward and backward underneath the false ribs on the right side. The symptoms often extend over ten days or a fortnight. Purgatives and stimulants are to be given.

FAR EASTERN QUESTION. The name commonly given to the complex problem of modern international politics growing out of the acquisition of interests in farther Asia and the Pacific by the Western Powers, with the rivalries consequent thereon, and the close contact of Oriental and Occidental peoples. Ever since the Portuguese mariners of Prince Henry the Navigator entered upon the quest of an eastward route to the Indies, and Columbus and his successors began their explorations to the westward, there may be said to have been a Far Eastern Question in embryo, but it remained for the rapid expansion of the world powers in the closing years of the nineteenth century to make it one of the most vital questions in world politics. For many years previously the European Powers had been chiefly concerned with the Eastern Question (q.v.) which had to do with Constantinople, the Ottoman Empire, and the western gates to Asia. The expansion of Russia across Asia to the Pacific; the spread of British commercial interests throughout the farther East; the growing ambition of Germany to establish trade supremacy in the East as an outlet for her capital and industry; and the rise of French colonies and protectorates in the Indo-Chinese Peninsula, brought into this distant part of the world the old rivalries of Europe. The decline of the Chinese Empire, which seemed destined to become an easy prey for the European nations, increased the eagerness of the Powers. Still the potentiality of resistance and endurance supposed to be latent in the ancient empire acted as a restraining influence, till the war between Japan and China in 1894-95 revealed China's weakness and showed the advent of a new power to be reckoned with in that part of the world. The Chinese-Japanese War, therefore, marked a distinct epoch in the development of the Far Eastern Question. When the terms of the Treaty of Shimonoseki (1895) became known, Russia, taking a lesson from the treatment she had received at the hands of the Powers at the Congress of Berlin in 1878, sought successfully to deprive Japan of some of the fruits of conquest and to gain advantages for herself. Stepping in as friend and protector of China, Russia was able a little later to secure as her reward the possession of the southern part of the Liao-tung Peninsula, with its two valuable harbors of Port Arthur and Ta-lien-wan. Great Britain obtained Wei-hai-wei as an offset to Russia's acquisition. Germany, which had coöperated with Russia in the repression of Japan, obtained, as compensation for the murder of two missionaries, the port of Kiao-chau and important concessions for operations in Shan-tung Province. All these territorial grants were made on leases for ninety-nine years.

In 1898 the fortunes of war established the United States, which had already annexed the Hawaiian Islands, in the Philippines. The United States has always advocated the preservation of the integrity of China, and the administration of President McKinley secured from the Powers interested in the East a nominal guaranty of the so-called 'open door' policy in China, that is, of equal rights of trade for all nations, without regard to spheres of influence. The value of this guaranty unless the demand for its observance is backed up by force is open to question.

In 1900 the Boxer movement involved China in a war with the Western Powers, which seemed for a while to threaten the integrity of the Empire. The situation at the close of the century may be thus briefly summed up: (1) Russia aiming at the possession or control of Manchuria, partly because of its value as a populous province, but more especially as insuring a direct outlet for the great Siberian railway system to the open sea; (2) Germany seeking to exploit for the benefit of her own trade and capital the rich Shan-tung and Yellow River country; (3) Great Britain endeavoring with halting and uncertain diplomacy to strengthen her position in the Yang-tse Valley, with a view to retaining her valuable commerce and a sphere of influence in case of partition, and to establishing ultimate connection by railway with Burma and India, holding, at the same time, to the open-door policy for all China as best; (4) France in the south leaning on the strong arm of Russia for support in her designs for colonial aggrandizement, and striving through shrewd diplomacy and the acquisition of railway concessions to connect with the Russian railways from the north, cutting across the British sphere on the upper Yang-tse; (5) off the Chinese coast, Japan, watchful, ambitious, and aggressive, determined to hold its own with the European Powers, desirous of a position on the mainland in case of partition of China, but preferring to join Great Britain and the United States in a policy looking toward the maintenance of the integrity of China and the open door; (6) the United States, with commercial interests in the East second only to those of Great Britain, averse to seizing territory, and while declining to unite with any other Power, seeking independently the same end as Japan.

Its Oriental policy, under the new conditions, can hardly be said to be determined.

The politics of China, like those of the whole Asiatic continent, are turning more and more upon railways. Already southern transcontinental lines are projected, and in the near future the question of the Far East promises to merge with that of the Nearer East and with the general issues of world politics. The anti-foreign outbreak of 1900, which brought the Powers together on common ground for a few weeks, only served to show how far they are from agreement and common action in Oriental affairs. The various phases and details of the question may be profitably studied in the following works, all of which are reliable in their facts and of practical value: Reinsch, *World Politics at the End of the Nineteenth Century as Influenced by the Oriental Situation* (New York, 1900), a useful manual with good lists of references; Norman, *Peoples and Politics of the Far East* (New York, 1897); Curzon, *Problems of the Far East* (2 vols., New York, 1896); Beresford, *The Break-Up of China* (New York, 1899); Colquhoun, *China in Transformation* (New York, 1898); id., *Overland to China* (New York, 1900); Leroy-Beaulieu, *The Awakening of the East*, trans. from the French (New York, 1900); Vladimir (pseud.), *The China-Japan War* (London); id., *Russia on the Pacific and the Siberian Railway* (London, 1899); Conant, *The United States in the Orient* (Boston, 1900). More detailed accounts of some of the events bearing upon this question, the general issues of which are here stated, will be found in the articles CHINESE EMPIRE and JAPAN.

FAREL, fȧ′rĕl′, GUILLAUME (1489-1565). A friend of Calvin and active promoter of the Reformation in Switzerland. He was born of noble family at Fareaux, near Gap, Dauphiné, in 1489. He studied in Paris, became professor in the Collège Le Moine, and was distinguished for his zeal for the Catholic Church. Intercourse with the Waldenses and the influence of his friend Lefèvre d'Estaples led him to accept the new teachings, and his vehement nature at once led him to attempt to make proselytes. In 1521 Bishop Briçonnet provided for him at Meaux, but his injudicious zeal compelled him to flee. He went to Basel and was kindly received by Œcolampadius, and there, on February 15, 1524, he publicly sustained thirteen theses on points in dispute between the Reformers and the Church. He preached in the Canton of Bern and through his exertions the towns of Aigle, Bex, Olon, Morat, and Neuchâtel embraced the Reformation. From 1532 till 1538 he labored mainly at Geneva, but was compelled temporarily to leave the city several times. In 1535 the town council of Geneva formally proclaimed the Reformation, but the organization fell into Calvin's hands rather than Farel's. Both Reformers had to leave the city in 1538, and Farel went to Neuchâtel, and did good service in setting the affairs of the Church there in order. He was present at Geneva at the burning of Servetus in 1553. In 1557 he was sent with Beza to the Protestant princes of Germany to implore aid for the Waldenses, and on his return sought a new sphere of labor in the Jura Mountains. In November, 1561, he was thrown into prison, but was soon liberated. He died at Neuchâtel, September 13, 1565. Farel's writings are not very important. Some of them may be found in *Du vrai usage de la croix* (Geneva, 1540; new edition, 1865). His letters are in Herminjard, *Correspondance des réformateurs dans les pays de la langue française* (9 vols., Geneva, 1866), and in the *Corpus Reformatorum* (Brunswick, 1834-1900). Consult: Kirchhofer, *Das Leben Wilhelm Farel's* (Zurich, 1831-33); Schmidt, *Etudes sur Farel* (Strassburg, 1836); and id., *Wilhelm Farel und Peter Viret* (Elberfeld, 1860); Bevan, *William Farel* (4th ed., London, 1893).

FARENSBACH, fä′rens-bäG, JÜRGEN VON (?-1602). A Livonian general. Sent as the ambassador of Livonia to Czar Ivan the Terrible, for the purpose of concluding a treaty of peace, he entered the Russian service, and greatly distinguished himself by winning the decisive battle on the Oka against the Tatars (August 1, 1572). Afterwards he served in the Danish and Polish armies, and in 1586 was invested with the rank of a Senator of the Polish crown by Sigismund III., whom he had assisted in gaining the throne of Poland. As field-marshal of Poland he subsequently fought against Sweden, where, however, he was defeated. He was killed in the attack on the Castle of Fellin, May 17, 1602.

FAREWELL, CAPE. See CAPE FAREWELL.

FAR′FA, ABBEY OF. A Benedictine monastery, at one time among the richest and most famous of Italy, situated not far from Rome. It was founded in the middle of the sixth century by Saint Laurence, Bishop of Spoleto, and soon reached a position of importance, receiving endowments from the Lombard and Carolingian rulers and from the popes. The monks were driven out by the Saracen invaders in the closing years of the ninth century, and it lay desolate for fifty years. When Alberic set Odo of Cluny over all the monasteries in the neighborhood of Rome, attempts were made at reforming the ill-regulated lives of the monks, but at first without success. The zealous Abbot Hugo, however, brought in a new set of monks at the end of the tenth century, and Odilo of Cluny, visiting Italy, inspired him to introduce the Cluniac reform. Pope Nicholas II. consecrated the conventual church in 1060, and learning began to flourish in a marked degree. The librarian of the monastery, Gregory of Catina, rendered a great service to Italian history by compiling between 1105 and 1119 the *Chronicon Farfense*. The riches of the abbey increased greatly, and no less than 683 churches and houses were said to have been subject to the abbot. From the end of the fourteenth century it was held *in commendam* by cardinals, and Gregory XVI. annexed it in 1842 to the Cardinal-Bishopric of Sabina. Consult Marocco, *Istoria del celebre imperial monasterio farfense* (Rome, 1834).

FARGO, fär′gō. A city and the county-seat of Cass County, N. D., 250 miles northwest of Minneapolis, Minn., on the Red River of the North (at the head of navigation), and on the Northern Pacific, the Great Northern, and the Chicago; Milwaukee and Saint Paul railroads (Map: North Dakota, J 3). Fargo is an important grain market, and has an extensive jobbing trade in agricultural implements, groceries, and notions. It has a public library, a United States land office, Saint John's Hospital, Fargo College

(Congregational), opened in 1887, and the State Agricultural College, founded in 1890. Other features of interest are the Roman Catholic and Protestant Episcopal cathedrals, and Island and Woodland parks. The government is administered under a charter of 1895 which provides for a unicameral city council, and a mayor, who is elected biennially, and controls the appointments to the several municipal boards. The city owns and operates its water-works. Settled in 1871, Fargo was incorporated in 1875. A fire on June 7, 1893, destroyed property valued at $3,000,000. Population, in 1880, 2693; in 1900, 9589.

FAR′GUS, Frederick John (1847-85). An English novelist (pseudonym, Hugh Conway), born in Bristol. An auctioneer by trade, he did not acquire reputation as an author until 1884, when he published *Called Back,* a novel which became very popular both in Europe and America, was translated into six languages, and successfully dramatized in London. Among other works may be mentioned *Dark Days; Slings and Arrows; A Cardinal Sin;* and *Bound Together.*

FARIÀ, fȧ-rē′ȧ, Abbé. See Monte Cristo, Count of.

FARIA Y SOUSA, fȧ-rē′ȧ ē sō′ī-zȧ, Manoel (1590-1649). A Portuguese-Spanish historian and poet. He was born upon an estate near Pombeiro, in the Province of Minho, was educated at Braga, entered the service of the Bishop of Oporto, but shortly after 1613 went to Madrid. In 1631 he was attached to the Spanish Embassy at Rome, where his talents attracted the attention of Pope Urban VIII. and many learned Italians. Returning to Spain, he made his home in Madrid, where he died. His numerous historical works, written in Spanish, include: *Epitome de las historias portuguezas* (1628); *Asia portugueza* (1666-73); *Africa portugueza* (1681). His poems were collected under the title *Fuente de Aganipe, rimas varias* (1624-27), besides three other volumes, *Fabula de Narciso e Echo, Divinas y humanas flores,* and *Noches claras* (1623-24). They consist of sonnets, eclogues, canzones, and madrigals, most of them written in Spanish. About 200 of the sonnets, however, and 12 eclogues are in the Portuguese language. He is also the author of a commentary upon the *Lusiad,* which, though thoroughly uncritical, is not without interest to students of Camões.

FARIBAULT, fâr′ĭ-bō. A city and the county-seat of Rice County, Minn., 52 miles south of Saint Paul; at the junction of the straight and Cannon rivers, and on the Chicago, Milwaukee and Saint Paul, the Chicago and Great Western, and other railroads (Map: Minnesota, E 6). It has a fine location, in a region which abounds in beautiful lakes. Faribault is noted as an educational centre, having State institutions for the deaf, blind, and feeble-minded, the Seabury Divinity School, opened in 1859, the Shattuck School for Boys, Saint Mary's School for Girls (Protestant Episcopal), and Bethlehem Academy for Girls (Roman Catholic). There is a public library, founded in 1874. Among the industrial plants are piano, wagon, and furniture factories, and flouring and woolen mills. Faribault was settled about 1850, and incorporated some twenty-seven years later. Its present government is administered by a mayor, elected annually, and a unicameral council. The city owns and operates its water-works. It was the home of Bishop Whipple, well known for his labors among the Indians. Population, in 1890, 6520; in 1900, 7868.

FARIDKOT, fûr′ĕd-kōt′. A native Sikh State of Punjab, India, with a capital of the same name 60 miles southeast of Lahore. Area, 612 square miles. Population, in 1891, 115,000; in 1901, 124,900.

FARĪD-UD-DĪN ÁṬṬĀR, fȧ-rēd′ ụd dēn ȧt-tär′ (c.1119-1229). A Persian poet and mystic. He was the son of a druggist, brought up to his father's business, and his real name was Muhammad ibn Ibrahīm, his better-known appellation, Farīd-ud-Dīn ‘Attār (‘the pearl of the faith, the druggist’), being a poet's name, or *takhalluṣ.* His life of 110 years was spent in the neighborhood of the city of Naishâpur. During the invasion of Genghiz Khan he fell a victim to an ignorant Mongol soldier. He studied the mystic philosophy of the Sufis, and was its principal representative after his pupil Jalāl ud-Dīn Rūmī. He was a voluminous writer, leaving no fewer than 120,000 couplets of poetry. His most famous work is the "Mantiq ut-Tair," or parliament of birds, an allegorical poem, according to which the birds, weary of anarchy, longed for a king. As the hoopoe who had guided Solomon through the desert best knows what a king should be, he is asked whom they shall choose. "The Sīmurgh in the Caucasus," is his reply. But the way to the Caucasus is long and dangerous, and most of the birds excuse themselves from the journey. A few, however, set out; but by the time they reach the great King's court, their number is reduced to thirty. The thirty birds, wing-weary and hunger-stricken, at length gain access to their chosen monarch, the Sīmurgh; but only to find that they strangely lose their identity in his presence—that they are he, and he is they. Consult: Garcin de Tassy, *Mantic uttaïr ou le langage des oiseaux, poème de philosophie religieuse, par Farid-uddin Attar* (Paris, 1857-63); Fitzgerald, *Salāmān and Absál . . . together with A Bird's-Eye View of Farid-uddin Attar's Bird-Parliament,* edited by Dole (Boston, 1899).

FARINA, fȧ-rī′nȧ *or* fȧ-rē′nȧ (Lat., flour, from *far,* coarse grain). The flour or powder of substances rich in starch, including cereal grains, as wheat and rice, leguminous seeds, as peas and beans, and roots such as potato and arrowroot, and other like compounds. A food product called farina, similar to hominy, but with coarser granules than meal and finer than those of hominy, is made from white maize. A similar granulated preparation, prepared from the inner portion of the finest wheat, is similarly named. Both products are employed in the making of gruel, puddings, etc. Farina is an important constituent of numerous prepared foods that are called *farinaceous* on account of the starch that they contain. In botany the pollen of flowers was formerly called farina.

FARINA, fȧ-rē′nȧ, Salvatore (1846—). A popular Italian novelist, whose sense of humor and graphic portrayal of character have earned him the title of the Italian Dickens. He was born at Sorso, in Sardinia, and studied law at Turin and Pavia, but after graduation devoted himself to a literary career, and made his home permanently at Milan. Among his numerous novels, which have been translated into several European languages, may be mentioned: *Due amori* (1869); *Fiamma vagabonda* (1872), new ed. under the title *Frutti proibiti* (1878); *Il romanzo di un vedovo* (1872); *Il tesoro di Donnina* (1877); *Amore bendato* (1873); *Capelli biondi* (1876); *Dalla spuma del mare* (1876); *Il signor Io* (1880); *Più forte dell' amore* (1890); *Il numero 13* (1896). For many years Farina was in charge of the literary department of the *Gazzetta Musicale.* At present he is editor of the *Rivista Minima*, and of a library of selected foreign fiction.

FARINATI, fä′rê-nä′tê, Paolo (1525-1606). An Italian painter, born in Verona. He was the pupil of Niccolò Gialfino and Antonio Badile; but his style was modified by his study of the Venetians, Titian, Veronese, and Giorgione, and more especially Giulio Romano. His works are amply conceived and rich in color. He also produced some etchings from his own designs that show originality and power. There is a "Saint Martin" by him in the Duomo at Mantua, but most of his works are in the Museum and churches of Verona. His son and pupil, Orazio, painted historical subjects.

FARINELLI, fä′rê-nĕl′lê, Carlo (1705-82). An Italian singer, whose real name was Broschi. He was the most remarkable male soprano known, his voice being of unequaled compass, possessing seven or eight notes more than those of ordinary vocalists. When still a child he was known all over Italy as 'ragazzo' (the boy), and from 1722 his career was one unbroken triumph. In Vienna he evoked a frenzy of enthusiasm by his dazzling feats of vocalization, but on the advice of Charles VI. applied himself to sustained singing and became equally great as a dramatic singer. In London (1734) Farinelli's presence in the company of his former teacher, Porpora, then in an operatic war with Handel, caused the latter to withdraw, and thenceforth to devote himself to oratorio. In Spain Farinelli's voice lightened the melancholia of Philip V. He became a great power at Court, and continued such until 1759, when Charles III. banished him. He built himself a palace in Bologna (1761), and there lived in royal luxury. Sachi wrote a *Vita del Cav. Don Carlo Broschi, detto Farinelli* (Venice, 1784).

FARINI, fȧ-rē′nê, Luigi Carlo (1812-66). An Italian statesman and historian, whose name stands next to those of Garibaldi and Cavour in the long struggle for United Italy. He was born at Russi, near Ravenna, graduated in medicine at Bologna twenty years later, and for a time practiced successfully as a physician. His share in the revolutionary movement of 1843 forced him, however, to leave the Roman States and live in exile in France, until the granting of the amnesty which followed shortly after the accession of Pius IX. In 1847 he entered the Liberal Cabinet as general secretary to Gaetano Rossi, the Minister of the Interior, and later became director-general of the sanitary department. After the assassination of Rossi, the flight of the Pope to Gaeta, and the proclamation of the Republic at Rome, Farini withdrew to Tuscany, and upon the occupation of Rome by the French, made his home in Piedmont, where he devoted himself to literary pursuits. He founded the satirical journal *La Frusta*, to support the Ministry of D'Azeglio, and became attached to the staff of Cavour's *Risorgimento*, but still had time during these years to write his most noted work, *Lo stato romano dall' anno 1814 fin al 1850* (1853), which made him widely known as a clear-sighted historian, and which has been translated into English under the superintendence of Gladstone (1859). Having become a citizen of Piedmont, he was elected Deputy to the Legislature, and in 1851 became Minister of Public Instruction in D'Azeglio's Cabinet, resigning the following year. In 1859 he was sent to Modena as royal commissary, was there proclaimed Dictator, and in 1860 exerted his influence in Parma, Bologna, and Florence, in favor of a united Italy under Victor Emmanuel. In 1860 he became Minister of the Interior in Cavour's new Cabinet. Later he accompanied the King to Naples, and remained there as civil governor. Upon the downfall of Rattazzi's Ministry in 1862, he was asked to form a new Ministry, but was soon after forced to retire, owing to failing health. His mind became affected, and he died August 1, 1866, near Genoa. Besides the *Roman State* above mentioned, Farini wrote a continuation of Botta's Italian history, *Storia d'Italia dall' anno 1814 fine ai nostri giorni* (1854-59). For further details of Farini's life, consult: Bersezio, in *Contemporanei Italiani* (Turin, 1860); Mauri, in *Scritti biographichi* (Florence, 1878); and Finali, in *Nuova Antologia* (Florence, 1878).

FARJEON, fär′jon, Benjamin Leopold (c.1836 —). An English author, born in London. He early went to Australia, where for a time he worked in the gold-diggings. Subsequently he proceeded to New Zealand, where he wrote his first book, *Shadows on the Snow*, and assisted in establishing at Dunedin the Otago *Daily Times*, the first daily journal published in the colony. Upon his return to London he worked as a dramatist, and in 1870 won his first success in prose fiction with *Grif.* In 1877 he gave public readings in the United States from his story *Blade-o'-Grass* (1871). Other works of his are: *Joshua Marvel* (1872); *London's Heart* (1874); *The House of White Shadows* (1884); *Samuel Boyd of Catchpole Square* (1899); and *The Mesmerists* (1900). His skill in the development of the intricacies of a melodramatic plot has been likened to that of Wilkie Collins. His works have been translated into Spanish, Italian, French, and German.

FAR′LEY, James Lewis (1823-85). An English author. He was born in Dublin, and was educated at Trinity College in that city. Upon the formation of the Ottoman Bank in Turkey he was appointed chief accountant of the Beirut branch, which had been established by him. In 1860 he became accountant-general of the State Bank of Turkey, Constantinople, which afterwards became incorporated with the Imperial Ottoman Bank. He did much to establish pleasant relations between England and the Levant, and in March, 1870, was appointed consul at Bristol by the Sultan. His numerous works on the Orient include: *Two Years in Syria* (1858); *The Druses and the Maronites* (1861); *The Resources of Turkey* (1863); *Turkey* (1866); *Egypt, Cyprus, and Asiatic Turkey* (1878); and *New Bulgaria* (1880).

FAR′LEY, John Murphy (1842—). An American Roman Catholic prelate, born at Newton Hamilton, Ireland. He came to America after his education had begun, was a student in the provincial seminary at Troy, and completed his theological studies at the American College in Rome. Here he was ordained in 1870, and two years later, after a short pastorate in Staten Island, he became secretary to Cardinal McCloskey. His abilities, especially as an organizer, were so highly regarded in Rome that he was unanimously chosen rector of the American College; but the Cardinal, who was then near his end, refused to part with him, recommending him, however, to the Pope for the honorary appointment of private chamberlain. In 1891 he became Vicar-General of the Archdiocese of New York, and in 1895 he was further honored by the appointment of prothonotary apostolic. Soon afterwards, when the growth of the archdiocese required the appointment of an assistant bishop, he was chosen for the position. Early in 1902, when the Archbishop desired to have a coadjutor with right of succession, instead of an auxiliary bishop, Monsignor Farley's name was mentioned, and in all probability he would have been appointed had not the Archbishop's death rendered necessary the appointment of a successor instead of a coadjutor. Again he was the unanimous choice, being mentioned first in the lists alike of the clergy of the diocese, the bishops of the provinces, and the archbishops of the United States. His official appointment to the see followed in October of the same year, being regarded as a promise of continuity in administration, since in the last years of his predecessor the practical work of the archdiocese had been largely in his hands.

FAR′LOW, William Gilson (1844—). An American botanist. He was born in Boston; studied at Harvard and in Europe, and was adjunct professor of botany at Harvard from 1874 to 1879, when he became professor of cryptogamic botany there. Among his publications are: *The Gymnosporangia or Cedar-Apples of the United States* (1880); *Marine Algæ of New England* (1881); and *A Provisional Host-Index of the Fungi of the United States* (1888).

FAR′MAN, Elbert Eli (1831—). An American jurist and diplomat. He was born at New Haven, Oswego County, N. Y., and was educated at Amherst College, and in Europe. He was consul-general at Cairo, Egypt, from 1876 to 1881, and a judge of the mixed tribunal from 1881 to 1884, in which capacity he displayed exceptional ability, and earnestly though unsuccessfully endeavored to secure the abolition of slavery. It was he who arranged the transfer of the famous obelisk known as "Cleopatra's Needle" (now in Central Park, New York) to America in 1879.

FARM BUILDINGS. The various buildings necessary for the occupation and operation of a farm are collectively known in England as the homestead, in Scotland as the onstead or steading, in America as the homestead or farmstead. They include the farmhouse with its attendant buildings providing accommodations for the farmer and his family and the farm laborers, and the barn and its attendant buildings providing for the storage and preparation for use of the farm products, storage of farm implements and machinery, the housing and care of stock, etc. Convenient, commodious, well-constructed, and well-arranged farm buildings for these purposes are essential to successful farming, both from the standpoint of the comfort and happiness of the farmer and from that of the proper care of the live stock, products, and equipment of the farm. For example, it is a generally recognized fact that well-housed animals thrive better and make a better return for the food consumed than those unduly exposed to cold and inclement weather, i.e. it is profitable as well as humane to house stock well.

The character of farm buildings will of course vary with the size of the farm and the system of farming practiced, whether grain, truck, or fruit farming, stock raising, dairying, poultry raising, etc. The requirements as regards such buildings have undergone and are undergoing great changes due to improvements of all kinds—the increased use of farm machinery, the keeping of more and better stock, superior methods of preparing and using feeding stuffs, etc. The most marked result of this change is seen in the tendency to make the homestead more compact, to reduce the number of separate buildings, and provide for a greater variety of purposes in a few larger buildings, as explained under Barn. The character of modern agriculture is such that farm buildings are becoming as complex in design and varied in use as factories, and indeed, in a sense, they are factories for the manufacture of marketable products—meat, milk, etc. The old practice of providing 20 or more separate buildings and scattering them over the farm is both inconvenient and expensive. The labor of collecting the crops in one place is less than is involved in passing from place to place to feed them out. The extent to which centralization is desirable, however, will depend largely upon the size of the farm. In case of very large farms, for instance, it may be of decided advantage to scatter the farm buildings somewhat. The danger of serious loss by fire is increased when the buildings are compactly grouped, but this is largely met by insurance against fire. It is not considered advisable to place the barn and outbuildings so near the farm house that fire in case of one necessarily endangers the other or the odors of the barnyard are offensive to the occupants of the house. However, it is important as a rule that the farm house should be located within a convenient distance of the barn, although not so near as to seem a part of the outbuildings. The homestead should be centrally located on the farm, in communication with as many fields as possible, and where an abundant supply of good water, good drainage, and plenty of light and air can be secured without unnecessary exposure to unfavorable weather conditions.

Three essentials to be considered in the construction of the ordinary farm house are comfort, convenience, and economy. It is hardly necessary to add that it is also important that the house should be attractive in appearance, with sanitary and pleasant surroundings. It should be planned with reference to future needs as well as present requirements, and so designed that it may be enlarged without impairing its symmetry of proportions or convenience of arrangement. Having decided upon the general features which the house must possess, it is as a rule best to employ a competent architect or builder to plan and work out the details of construction. This may be said with equal truth of all other farm buildings, except those of very simple construction. In planning the barn and out-buildings, as in case of the farm house, the purposes for which they are to be used should be carefully considered in advance to the end that they may be conveniently arranged, of ample capacity, and may be enlarged without undue resort to annexes, lean-tos, sheds, etc. With the increased production of high-bred, high-priced stock, ventilation and sanitation of stables is second in importance only to that of dwelling houses. The large choice of building material now available makes cheaper construction than in former years possible, although the questions of the best material for construction and best methods of ventilation and sanitation are in large part still unsolved. Among the accessory structures forming most important additions to modern farm equipment are the silo (q.v.) and cold storage houses and cellars.

Consult, in addition to works noted under BARN, King, *Physics of Agriculture* (Madison, 1901); Roberts, *The Farmstead* (New York, 1900); Scott, *Text-book of Farm Engineering* (London, 1885).

FARMER, HUGH (1714-87). An English Independent clergyman, born in the Parish of Saint Chad, Shrewsbury (Shropshire). He was a pupil of Dr. Philip Doddridge at Northampton, and from 1739 until his resignation in 1780 was pastor of a church at Walthamstow, London. From 1761 to 1772 he was also afternoon preacher at Salters's Hall, and from 1762 to 1780 a preacher at the Tuesday morning 'merchants' lecture' in the same place. His reputation as a pulpit expositor was high. As a writer he was considerably in advance of the theology of his time, although he never clearly defined his own position. His publications are scholarly, and include chiefly *An Inquiry into the Nature and Design of Christ's Temptation in the Wilderness* (1761; 5th ed. 1822); and *An Essay on the Demoniacs of the New Testament* (1775; 4th ed., called the 3d, 1818). The former was designed to show that the temptation of our Lord was of the character of a divine vision, and therefore subjective; the latter, that the persons mentioned were merely afflicted by certain diseases. Consult Dobson, *Memoirs of the Life and Writings of the Reverend Hugh Farmer* (London, 1805).

FARMER, JOHN (1789-1838). An American genealogist, born at Chelmsford, Mass. Besides editing Belknap's *History of New Hampshire*, he published a *Genealogical Register of the First Settlers of New England* (1829), which contains much information concerning early New England settlers; and, in collaboration with J. B. Moore, *A Gazetteer of New Hampshire* (1823).

FARMER, MOSES GERRISH (1820-92). An American inventor and electrician. He was born in Boscawen (now Webster), N. H., and was educated at Andover, N. H. His early inventions included a new kind of window-shade and paper curtain, and by means of machinery he was able to supply the extraordinary demand for them that soon arose. Becoming interested in electrical science, he invented an electro-magnetic engine and electrical locomotive. He devised the municipal fire-alarm which was adopted by the city of Boston, and very quickly by other cities all over the country. (See FIRE PROTECTION.) He moved to Salem in 1848, and became superintendent of the telegraph line from Boston to Burlington, Vt., inventing many improvements in telegraphy, among them a quadruple system by which four messages were sent simultaneously over the same wire. In 1852 he invented an electrical cooking-stove. In 1855 he succeeded in electrically depositing aluminum, and constructed for the Dudley Astronomical Observatory in Albany a chronograph and electrical clock. In 1856 he made an electric gyroscope so as to run continuously at uniform speed, and read a paper on multiplex telegraphy before the American Association for the Advancement of Science. In 1859 he lighted his parlor in Salem with an incandescent electric lamp, deciding, however, that a galvanic battery could not be used as a source of electric lighting. From 1864 to 1868 he experimented with alloys, and coated iron and steel wire with copper in order to combine great tensile strength with high conductivity. In 1868 he had a dynamo made with which he lighted 40 incandescent lamps in multiple arrangement. In 1872 he was appointed electrician to the United States Torpedo Station at Newport, but resigned on account of paralysis in 1881. On July 26, 1897, on the fiftieth anniversary of the exhibition at Dover, N. H., by Farmer of the first operative electric railway, the general meeting of the American Institute of Electrical Engineers was held at Eliot, Me. Here are preserved Farmer's workshop and note-books, and here the inventor lies buried. Consult Dolbear, "Moses G. Farmer as an Electric Pioneer," in *Electricity* (New York, 1894).

FARMER, RICHARD (1735-97). An English scholar and author, born at Leicester (Leicestershire). He graduated in 1757 at Emmanuel College, Cambridge, in 1760 became classical tutor of the college, and in 1775 its master. In 1778 he was elected principal librarian of the university, and in 1788 was appointed by Pitt to a residentiary prebend in Saint Paul's, London. He was an intimate friend of Dr. Johnson, whom he met upon the occasion of the latter's visit to Cambridge in 1765, and of whose Literary Club he was a member. As the head of Emmanuel College he was markedly successful, and for years he was the most influential person at Cambridge. He is described as eccentric to a degree, and supremely indolent. His only published work is the *Essay on the Learning of Shakespeare* (1767), a scholarly and most valuable demonstration of the fact that the poet's knowledge of Latin, Greek, French, Italian, and Spanish literatures was derived from English translations and references. This famous commentary has remained unsurpassed in its field. Farmer was elected a fellow of the Society of Antiquaries of London in 1763, and twice declined a bishopric proffered him as a recognition of his stout Toryism. Consult Nichols, *Literary Anecdotes of the Eighteenth Century*, vol. ii. (London, 1812-15).

FARMER GEORGE. A popular name given to George III. of England because of his dress, manners, and habits. He is said to have kept a farm for the small profit rather than for pleasure.

FARMERS' ALLIANCE. A political party in the United States, which became of national importance in 1890, especially in the South and

West. The movement originated in 1876 as a county institution in Texas, which soon grew into a State alliance. Its object at first was similar to that of other farmers' organizations, such as the Grange (q.v.). Kindred societies grew up in other States, such as the Wheel in Arkansas, founded in 1882, and the Farmers' Union in Louisiana. In 1887 a national alliance was formed out of several State societies, and its political character soon became marked. Meetings were held in 1888 and in 1889, and at the latter a platform of principles was agreed upon by the Alliance and the Knights of Labor, and the name became the National Farmers' Alliance and Industrial Union. The platform demanded the abolition of national banks, increased issues of legal-tender greenbacks, laws against dealings in futures of agricultural and mechanical products, free and unlimited coinage of silver, and Government ownership of all means of transportation and intercourse. In the South the Alliance demanded the establishment by the Government of sub-treasury warehouses where farmers could deposit their products and receive currency in exchange, and also the opportunity to borrow money from the Government at nominal interest. In the campaign of 1890 the Alliance in the South did not put forth separate candidates, but dictated the nominations of the Democratic party, especially in South Carolina. In the West there were separate nominations. The election gave the Alliance the control of the legislatures of Kansas and Nebraska, and the balance of power in Illinois, Minnesota, and South Dakota. It sent nine men to the House of Representatives, and Senators from Kansas, South Dakota, and South Carolina, but the latter was called a Democrat. In 1892 the organization united with other elements and formed the People's Party (q.v.), nominating a President. This was not done without a split in the Alliance, however, most of the Southern members refusing to leave their old political connections. The new party continued the demand for the sub-treasury scheme, free silver, more greenbacks, and public ownership of means of communication and transportation. The Alliance ceased to be a political party, but continued as an organization for the betterment of the agricultural classes.

FARMER'S ALLMINAX, The. An annual publication, from 1869 to 1880, by Josh Billings (Henry Shaw). It parodied the old *Farmers' Almanac,* and became very popular. Its sales reached several hundred thousand copies.

FARMER'S BOY, The. A famous poem by Robert Bloomfield, published in 1800 owing to the exertions of a discerning patron, Capel Lofft. It is a description of youthful life in the country, and contains pictures of such rural occupations as plowing, sowing, reaping, sheaf-binding, and rook-shooting. The poem was very popular, and was translated into French, Italian, and Latin.

FARMERS-GENERAL (Fr. *fermiers-généraux*). The name given to the members of a privileged association in France, who farmed or leased the public revenue of the nation under the old régime. This peculiar system of tax-gathering dated from the early fourteenth century, when the *gabelle* or salt tax was farmed out in order to raise money for the war against England. In time other taxes were instituted and farmed out, until in the year 1720 there was a special administrative board formed, presided over by one of the farmers-general, or by one of his assistants, for each class of imposts. The Minister of Finance selected the farmers-general at his pleasure, but his choice was generally influenced by bribes (*pot-de-vin*). The royal favorites were frequently given control of various imposts in lieu of pensions. The number of farmers-general was ordinarily 40, but shortly before the Revolution it had risen to 60. The entire sum which it was necessary to place in the national treasury—or, in other words, the annual national revenues—amounted to 180,000,000 livres. All returns above this sum went into the pockets of the farmers-general, many if not most of whom accumulated large fortunes. Those in power were bribed to support this corrupt and ruinous financial system, though Turgot and Necker sought to change it. The Constitution of 1791 did away with the farming of the revenues, while the Revolutionary Tribunal sent many of the ex-farmers-general to the guillotine. Consult: De Nervo, *Les finances françaises sous l'ancienne monarchie,* etc. (Paris, 1863); Lemoine, *Les derniers fermiers-généraux* (Paris, 1873); Vuitry, *Etudes sur le régime financier de la France avant la révolution de 1789* (Paris, 1883); Bouchard, *Système financiers de l'ancienne monarchie* (Paris, 1891); Tocqueville, *France before the Revolution of 1789,* English translation (London, 1888); Taine, *The Ancient Régime,* English translation (London, 1876); Lowell, *The Eve of the French Revolution* (Boston, 1892).

FARMERS' INSTITUTE. A meeting of farmers for mutual improvement in their business or home life. These meetings have grown out of the public meetings held at a comparatively early day in the United States under the auspices of local or State agricultural societies. The institutes are carried on under varied auspices and are supported in very different ways in different sections, but the character of the meetings themselves is essentially the same everywhere. They may last but half a day, as in Louisiana, where the farmers assemble once a month at the experiment stations, or may continue three or four days. The tendency, however, seems to be toward shortening the duration and increasing the number of meetings, by which means a greater number of localities may be reached. The winter, when the stress of farm work is somewhat lessened, is the season usually favored; but in some States very successful meetings have been held at other seasons of the year.

The programmes are planned to promote the interchange of ideas, a full and free discussion being sought upon topics introduced in an address or paper by some specialist. Officers of agricultural colleges and experiment stations, and other experts, as well as successful farmers who have attained more than local reputation, are usually selected as institute workers by those who have charge of the system of institutes for the State. These workers may also be chosen by the local authorities from lists of such workers prepared by a central bureau. The local committee invites successful farmers of the neighboring districts to explain their methods, provides music, and literary or other general exercises, and arranges for the place of meeting, refreshments, and advertising. All persons in attendance, the humblest as well as the most prominent, are urged to ask questions on points suggested in the address, and to present related facts gained from personal experience. A 'question box' is frequently made use of, answers being given by the conductor of the institute, or by some one specially fitted to supply the information asked for. For the evening sessions the usual plan is to have a popular lecture upon some subject of general agricultural interest. This address is made somewhat more elaborate and complete than those of the day sessions, and less opportunity is given for discussion.

While the character of the institutes is such as to make it impossible to assign any definite date as the time of their differentiation from other farmers' assemblies, yet the period following the organization of the agricultural colleges under the Morrill Act of 1862 seems to have been the time when the farmers' institutes took a distinct form, and under that name began to receive the patronage of the States. Thus, in 1862 the Massachusetts State Board of Agriculture held a public meeting of four days' duration, and in 1866 the Connecticut State Board of Agriculture held its first farmers' convention for lectures and discussion. In 1870 the newly organized State Board of Agriculture of New Hampshire began a series of farmers' meetings, and in the following year Vermont followed this example. During the same year the Massachusetts board requested the 29 agricultural societies of the State to organize annual meetings, to be denominated the "Farmers' Institutes of Massachusetts," and several societies began at once to hold such meetings. About the same time institutes were inaugurated in Iowa, Kansas, and Michigan by the agricultural colleges of those States. Other States soon joined the movement, and legislatures began to make appropriations to maintain the institutes. In 1885, when the board of regents of the University of Wisconsin organized a course of institutes, a special officer, called the Superintendent of Farmers' Institutes, was appointed to plan and manage them, and this arrangement was afterwards confirmed by the State.

Farmers' institutes are now regularly held in almost all the States and Territories. In about half the States they are under the control of the agricultural bureaus connected with the State governments, and in the other half they are held under the auspices of the agricultural colleges. It is estimated that at least 2000 institutes are now annually held in the United States, with an aggregate attendance of over 700,000 farmers. The importance of the institutes as factors in the general education of farmers in some of the States where they have been most successful may be indicated by the following brief statistics. In Wisconsin there are now annually held 120 institutes, with an average annual attendance of nearly 50,000 persons. The annual institute *Bulletin*, a book of 300 pages containing the best addresses of the season, is published, and 60,000 copies distributed. A copy of this book is put into every school library in the State. For this work the State appropriates $12,000 annually. In Minnesota 70 farmers' institutes are held, with an attendance of 22,000. The State makes an annual appropriation of $13,500 for the institutes, and 25,000 copies of their annual report are distributed. In Massachusetts 125 institutes are held, with an attendance of about 11,000; in West Virginia 60 institutes, with an attendance of 4000; in Indiana 100 institutes, with an attendance of 25,000; in Kansas 155 institutes, with an attendance of 64,000; in Nebraska 60 institutes, with an attendance of 30,000; in Pennsylvania 320 institutes, with an attendance of nearly 150,000; in Ohio 275 institutes, with an attendance of 95,000; in California about 80 institutes, with an attendance of 20,000; in New York over 300 institutes, with an attendance of 75,000; in Michigan 200 institutes, with an attendance of 85,000. The general interests of the institutes are promoted by the American Association of Farmers' Institute Workers, and by the Office of Experiment Stations of the United States Department of Agriculture, Washington, D. C. The department publishes the proceedings of the association, and in its *Year Book* gives a list of officials in charge of farmers' institutes in the different States.

FARMER'S LETTERS. A series of twelve letters, ostensibly by a farmer, which appeared in 1767. Their author was soon discovered in John Dickinson, a prominent Pennsylvanian. They were political tracts, denouncing the taxation of the Colonies by Parliament without their consent, and had great influence in shaping public opinion.

FARMING. See AGRICULTURE.

FAR'MINGTON. A town and county-seat of Franklin County, Maine, 83 miles north of Portland; on the Maine Central, and the Sandy River railroads (Map: Maine, C 6). It has the Farmington State Normal School, and the Abbott Family School for boys, and a public library. Among the industrial establishments are machine-shops, lumber and grist mills, wood-turning shops, carriage-works, and canning factories. Population, in 1890, 3207; in 1900, 3288 (Farmington village in 1900, 1251).

FARMINGTON. A city and the county-seat of Saint François County, Mo., 90 miles south by west of Saint Louis, and two miles from De Lassus, its railroad station on the Saint Louis, Iron Mountain and Southern Railroad (Map: Missouri, F 4). The Farmington Baptist College, Carleton Institute, and Elmwood Seminary for Girls are located here. It is the centre of a productive lead-mining region, and has carriage and wagon works, flour-mills, lumber-mills, machine-shops, etc. Population, in 1890, 1394; in 1900, 1778.

FARM'VILLE. A town and the county-seat of Prince Edward County, Va., 70 miles southwest of Richmond; on the Appomattox River, and on the Norfolk and Western Railroad (Map: Virgina, F 4). The State Female Normal School, established in 1884, is located here. Farmville is in a fertile agricultural region, and is an important tobacco-manufacturing centre. It has several lithia springs, which are noted for their medicinal properties. Population, in 1890, 2404; in 1900, 2471.

FAR'NABY, or FARNABIE, THOMAS (c.1575-1647). An English schoolmaster and classicist, born in London and educated at Oxford. He was converted to Catholicism, and received a further classical training at a Jesuit college in Spain. He was the companion of Sir Francis Drake and John Hawkins on their last voyage, was engaged in military service in the Low Countries, and finally became established at Martock, Somersetshire, where he opened a school which subsequently was removed to London, and there enjoyed the patronage of the aristocracy and was attended by more than three hundred pupils. Many eminent clergymen and statesmen received their education here, and before 1629 the school had acquired a European reputation. Upon the outbreak of the plague in 1636, it was removed to Sevenoaks, an estate which Farnaby had bought in Sussex. The publications of Farnaby include annotated editions of many ancient authors and a *Systema Grammaticum* (1641), or Latin grammar, written at the request of Charles I., and designed to replace the one previously in use in the public schools.

FARNBOROUGH, färn′bûr-ô. A town in Hampshire, England, on the Blackwater, near the Basingstoke Canal, about 33 miles southwest of London (Map: England, F 5). It is famous for its strawberry gardens, cultivated for the London market. In the neighborhood is Farnborough Hill, long the residence of ex-Empress Eugénie, with the mausoleum containing the tombs of Napoleon III. and the Prince Imperial. Farnborough is one of the stations for Aldershot Camp. Population, in 1891, 8000; in 1901, 11,500.

FARNE, färn, or **FERN ISLES**, or The Staples. A group of seventeen islets and rocks, some of which are visible only at low tide, two to five miles off the northeast coast of Northumberland, opposite Bamborough, England (Map: England, E 1). On one of the islands is the tower of a priory, built to the memory of Saint Cuthbert, who spent the last two years of his life here. The passage between the islands is very dangerous in rough weather, and was the scene of Grace Darling's heroism in 1838, when the *Forfarshire* was wrecked. There are two lighthouses.

FARNESE, fär-nâ′sâ. The name of an illustrious Italian family, first mentioned in the middle of the thirteenth century, when it possessed the castle of Farneto, near Orvieto. In 1534 Cardinal Alessandro Farnese was raised to the Papal throne as Paul III. (q.v.), and as his great aim was the aggrandizement of his family, he erected Parma and Piacenza into a duchy, which he bestowed on his natural son, Pietro Luigi. Pietro was assassinated in 1547, and was succeeded by his son Ottavio (1520-86), who married Margaret of Austria, a natural daughter of Charles V., and the greater part of whose reign was both peaceful and prosperous.—Alessandro Farnese, Prince of Parma, and Spanish Governor in the Netherlands, was the son of Ottavio, and was born in 1547. After being educated at the royal Court at Madrid, he entered the Spanish service, made his first campaign under his uncle, Don Juan of Austria, and distinguished himself at the battle of Lepanto, in the year 1571. In 1577 he was sent with reinforcements to Don Juan in the Low Countries, then in a state of insurrection, and contributed to the victory at Gembloux, January 31, 1578. He was next made Governor of the Spanish Netherlands by Philip II., and carried on the war against the Prince of Orange. By skillful diplomacy more even than by his military talents, Farnese succeeded in winning back the Walloon provinces and several important towns. The assassination of William the Silent in 1584 aided his cause, and in 1585 he was able to reduce Antwerp after a memorable siege; but the project of the Armada (q.v.) interfered with his conquests in the Low Countries, and the ill success of the expedition against England, in which he had been given the command of the troops destined for the invasion of that country, grieved him the more from the contrast it presented to his former good fortune. In 1590 he was dispatched to the assistance of the Catholics in France, and compelled Henry IV. to raise the siege of Paris. Being, however, ill supplied with provisions and money and insufficiently supported by the League, he was forced to yield to the superior power of Henry IV. and withdrew his forces. In 1591 he was once more forced to relinquish the conquest of the Netherlands and embark on a French campaign. After raising the siege of Rouen, he was again compelled to withdraw. Returning, in spite of shattered health, in 1592, he died suddenly at Arras, December 2. Alexander Farnese was one of the greatest generals of his age, and though severe in his discipline, was almost worshiped by his soldiery.—Ranuccio (1569-1622), his son and successor in the Duchy of Parma, was sombre, greedy, and proud. He was succeeded by his second son, Odoardo (1612-46), a prince remarkable for the elegance of his manners, his magnificence, magnanimity, and liberality.—Elizabeth Farnese (1692-1766), the daughter of Odoardo II., married, in 1714, Philip V. of Spain. Of a domineering and ambitious nature, she completely ruled the King. She involved Alberoni (q.v.) in her aggressive policy, the object of which was to establish her sons, Carlos and Philip, over principalities in Italy. The male line of the Farnese family became extinct in the person of Antonio, who died in 1731.

The name of the Farnese family is connected with several celebrated palaces and works of art. The principal ones are: (1) The Farnese Palace at Rome, an edifice erected by Pope Paul III., before his accession to the Holy See, after the designs of Antonio da Sangallo. It is in the form of a quadrangle, and was completed by Michelangelo. The palace is one of the finest in Rome. The antique sculptures for which it was formerly renowned are now in the museum at Naples; a few classic works, however, are still to be seen in the great hall. (2) The Farnesina (or Villa Farnese), a magnificent palace in Trastevere, Rome. It owes its celebrity chiefly to the frescoes of Raphael; but it also contains frescoes by Peruzzi and Sebastian del Piombo, and a colossal head in chiaroscuro, attributed to Michelangelo. (3) The Farnese Bull is the name given to a colossal group attributed to Apollonius and Tauriscus of Tralles, in Asia Minor, who probably belonged to the Rhodian school and lived about B.C. 300. The group represents Dirce bound to the horns of a bull by Zethus and Amphion, for ill usage of their mother, Antiope. Pliny mentions the transference of the group to Rome, where it first adorned the library of Asinius Pollio, and afterwards the baths of Caracalla. It was discovered in the year 1546, restored by Bianchi, and placed in the Farnese Palace. (4) The Farnese Hercules, copied by Glykon from an original by Lysippus. It exhibits the hero, exhausted by toil, leaning upon his club, the head inclined, the expression melancholy; one hand is held behind his back, grasping one of the apples of the Hesperides.

For the early history of the Farnese family and their part in the Renaissance, consult: Symonds, *The Renaissance in Italy* (7 vols., London, 1875-86); Gregorovius, *Geschichte Rom* (9 vols., Stuttgart, 1886-96; Eng. trans., London, 1894-1900); also the works of Muratori and of the Italian biographer Strada. For Alessandro Farnese, the accounts given in Motley, *Rise of the Dutch Republic,* and id., *The United Netherlands;* Blok, *Geschiednis von het nederlandsche Volk* (Gröningen, 1892-99; Eng. trans., New York, 1898-1900); Pietro, *Alessandro Farnese, duca di Parma* (Rome, 1886); and Gachard, *Correspondance d'Alexandre Farnese avec Philippe II., 1578-79* (Brussels, 1853). For the history of the dukes or princes of Parma: Scarabelli, *Storia civile dei ducati di Parma* (Piacenza, 1858); Pezzano, *Storia della città di Parma* (Parma, 1837-59). For Elizabeth Farnese: Armstrong, *Elizabeth Farnese, the Termagant of Spain* (London, 1892).

FARNESE BACCHUS. A fine torso of Bacchus in the National Museum at Naples, a Greek work dating from the fourth century B.C.

FARNESE HERCULES. A statue of Hercules, which is now in the Naples Museum. It got its name from the Farnese family, in whose possession it was for some time after its excavation at the Baths of Caracalla. It dates from the age of Hadrian, and is probably an imitation, by the Athenian sculptor Glycon, of one of the bronzes by Lysippus. The statue shows Hercules leaning on his club in an attitude of exhaustion, and holding the apples of the Hesperides behind him in his right hand. The muscles of the back and arms are enormous; the legs are too long, and the head unduly small, the whole effect of the statue being one of exaggeration, by which the sculptor evidently intended to emphasize the hero's semi-godlike character.

FARNESE HOMER. A beautiful bust in the National Museum at Naples, the finest of the ideal representations of the poet.

FARNESE JUNO. A colossal head of Hera in the National Museum at Naples, a replica of a bronze original. The expression is austere and majestic. The head surpasses all like conceptions of the goddess, and gives a clear idea of the ideal of Polyclitus.

FARNESE MINERVA. An archaic Greek statue of Pallas Athene, found at Velletri, now in the National Museum at Naples. The statue resembles that of the Parthenon. It is partially restored.

FARNESIAN BULL. A group of statuary by the Rhodian sculptors Apollonius and Tauriscus, which is now in the museum at Naples. The subject is based on the legend which tells how Antiope, a slave of Dirce, was to be bound to the horns of a wild bull by order of her mistress. She fled to her sons, who seized Dirce herself and bound her to the bull. The arrangement of the group shows Zethus and Amphion, the sons, binding the wild bull, while Dirce throws herself forward entreating mercy, and Antiope stands motionless in the background. The statue was taken from Rhodes to Rome; was there lost for several centuries, then found in the Baths of Caracalla, and sent in 1786 from the Farnese Palace to the Museum at Naples.

FARNHAM, färn'ȧm. A market-town of Surrey, England, on the Wey, 10 miles west-southwest of Guilford (Map: England, F 5). The principal feature is the stately old castle of the Bishops of Winchester, first built by Henri de Blois, Bishop of Winchester, brother of King Stephen. The castle was razed by Henry III., rebuilt and garrisoned by Charles I., and restored in 1684 to its present state by Bishop Morley. A new town-hall was erected in 1666. Some parts of the Gothic parish church were built in the twelfth, fifteenth, and sixteenth centuries. The edifice was originally a chapel of ease to Waverley Abbey, founded in 1128, 10 miles east-southeast of Farnham, whose picturesque remains are said to have suggested to Sir Walter Scott the name of his first novel. The town owns its waterworks and electric-lighting plant. The chief trade is in hops, a very fine variety of which is grown in the vicinity. William Cobbett was born and buried here. The vicinity of Aldershot Camp, six miles to the north of Farnham, has increased the activity of the town. Farnham has belonged to the bishops of Winchester since Ethelbald of Wessex bestowed it on them in 860. Population, in 1891, 5545; in 1901, 6124.

FARNHAM, or WEST FARNHAM. A town of Missisquoi County, Canada, at the confluence of the two main branches of the Yamaska River, 35 miles southeast of Montreal. It is an important railway and manufacturing centre. The Canadian Pacific Railway forms a junction here with various branch lines. It has fine public buildings, including a spacious railway depot, carries on beet-sugar industries, and a considerable agricultural trade. The United States is represented by a consular agent. Population, in 1891, 2822; in 1901, 3114.

FARNHAM, ELIZA WOODSON BURHANS (1815-64). An American philanthropist and author. She was born in Rensselaerville, N. Y., and married Thomas Jefferson Farnham, the traveler. From 1844 to 1848 she was matron of the Sing Sing State prison. While there she sought, with much success, to prove it possible to govern such an institution by kindness only. She published *Life in Prairie Land* (1846). In 1848 she was connected with the management of the Boston Institution for the Blind, and some years later organized a society to aid and protect destitute women in emigration to the West. Her further publications include: *California Indoor and Out: or, How We Farm, Mine, and Live Generally in the Golden State* (1856), and her most important work, *Woman and Her Era* (1864).

FARNHAM, RALPH (1756-1861). A soldier in the American Revolution, and the last survivor of the battle of Bunker Hill. He was born in Lebanon, in what was then the district of Maine, and was the first white settler at Acton, Maine, where he died. In October, 1860, he was invited to Boston, where a public concert was given in his honor in Tremont Temple. He lived one hundred and four years, nine months, and nineteen days.

FARNHAM, ROSWELL (1827—). An American lawyer and governor. He was born in Boston, Mass., and was educated at the University of Vermont, where he graduated in 1849. He taught school for several years, studied law, and was admitted to the bar in 1869. After serving in the Civil War as captain and colonel in a Vermont regiment, he became a member of the State Senate in 1868. He was Governor of Vermont from 1880 to 1882.

FARN′WORTH. A town of Lancashire, England, three miles south-southeast of Bolton-le-Moors and 15 miles northwest of Manchester (Map: England, D 3). It is a junction station on the Manchester and Bolton Railway, and is an important industrial centre, with manufactures of cotton and paper, and iron-foundries. It has a notable chapel, a picturesque embattled building of the fifteenth century. Population, in 1891, 23,800; in 1901, 25,900.

FARO, fä′rô. A seaport of Portugal in Algarve, capital of the district of its own name, situated on the southern coast, 140 miles southeast of Lisbon (Map: Portugal, B 4). It has a partly ruined Moorish castle surrounded by old walls, a fine cathedral, a number of convents, and a seminary, a military hospital, and a military school. The harbor, at the mouth of a small river, and protected by islands, is spacious but not very deep. The town has, nevertheless, an active trade in fruits, oil, sumach, anchovies, wine, cork, etc. There are deposits of salt and antimony in the vicinity. Faro was recovered from the Moors in 1260. It was sacked in 1596 by the English, and has suffered severely from earthquakes, notably in 1722 and 1755. Population, in 1890, 9338; in 1900, 11,835.

FARO, fâr′ô *or* fā′rô, or **PHAR′AON** (from a picture of *Pharaoh*, formerly put on one of the cards). A game of cards played by any number of persons, for purely gambling purposes. A pack of cards is placed, face downward, in a clasp which allows one card at a time to be withdrawn from the top of the pack. The spectators bet before each card is drawn and exposed that it will be a court card, or black, or red, or have such and such a number of spots on it; and they win or lose as the case may be. When none but the last three cards are to be drawn, the betting is limited to the question in what order they will turn up.

FAROCHON, få′rô′shôN′, JEAN BAPTISTE EUGÈNE (1812-71). A French medalist and sculptor. He was born in Paris, studied under David, and in 1835 was awarded the Prix de Rome for his work in medallions. In this line of art he acquired a high reputation, and in 1863 became professor at the Ecole des Beaux-Arts. . The statue of Christ in the Church of Saint Vincent de Paul, Paris, represents his work in marble.

FAROE (fā′rô *or* fā′rô-*e*) **ISLANDS** (Dan. Färöerne). A group of islands, twenty-one in number, of which only seventeen are inhabited, belonging to Denmark, and lying nearly midway between the Shetlands and Iceland, extending from latitude 61° 25′ to 62° 25′ N., and from longitude 6° 20′ to 7° 40′ W. (Map: Denmark, A 1). The principal island, Strömö (capital, Thorshavn), is 27 miles long and 8 miles broad; those next in importance are Osterö, Vaagö, Borö, Viderö, Sandö, and Suderö. Their entire area is 514 square miles. They are mostly of volcanic rocks, with basaltic formations covered with a thin vegetable soil, which yields pasturage for the cattle and numerous sheep which are reared on the islands. The highest point does not exceed 3000 feet, and there is a lack of streams, but small fresh-water lakes are numerous. The coasts, which are steep and lofty, are broken by deep inlets, and in the adjacent waters are whirlpools and currents, which render navigation perilous. The hurricanes which prevail prevent the growth of trees and hinder the cultivation of most of the ordinary vegetables and cereals; but the climate is so modified by oceanic influences that, notwithstanding the high latitude, snow rarely lies long on the ground, and the cattle can pass the greater part of the year in the open air. The rainfall is excessive, amounting to about 70 inches during the year. Coal and peat are found, and there are also traces of iron, copper, and chalcedony. The chief sources of wealth are in flocks of sheep and in the multitudes of sea-fowl which frequent the rocks. The islanders show great skill in climbing the dangerous cliffs in search of birds, and they are also expert in fishing. Their exports are tallow, train-oil, feathers, skins, wool, fish, and butter. The people are of Norse descent—a vigorous, laborious, loyal, and religious race, belonging to the Lutheran Church. They are governed by a Lagthing consisting of eighteen members elected for four years, and presided over by a Danish Governor. The group is represented in the Danish Parliament by two representatives selected by the people—one directly and the other through the local Government. The islands, which were colonized by the Norwegians in the ninth century, were held by Norway individually until the latter part of the fourteenth century, when they were shared with Denmark, which became sole possessor in 1814. The language of the people is only a slightly modified form of the old Norse. Population, about 13,000. Consult Jeaffreson, *The Faroe Islands* (New York, 1901).

FARQUHAR, fär′kwẽr, GEORGE (1678-1707). An English dramatist. He was born at Londonderry, Ireland, and entered Trinity College, Dublin, in 1694, but left without a degree. He was then engaged as an actor by one of the Dublin theatres. Playing the part of Guyomar in Dryden's *Indian Emperor,* he accidentally wounded a brother performer, and was so shocked by the occurrence that he at once quitted the boards. Accompanied by the actor Wilkes, he proceeded to London, and shortly afterwards received a commission in the regiment commanded by the Earl of Orrery, which was then stationed in Ireland. Urged by Wilkes, he produced in 1699 his first comedy, entitled *Love and a Bottle,* which proved a success. The next year appeared his *Constant Couple,* which met with a brilliant reception, and to which he wrote a sequel called *Sir Harry Wildair.* In 1702 he produced *The Inconstant,* founded on the *Wild-Goose Chase* of Beaumont and Fletcher—a version in which all the coarseness and none of the poetry is retained. This was followed by *The Twin Rivals* (1702); *The Stage Coach* (1704); and a fine military comedy called *The Recruiting Officer* (1706). He had married in 1703, and, falling into serious pecuniary difficulties, he sold his commission. He felt his poverty keenly, but nevertheless during his last illness wrote the best of his plays, *The Beaux' Stratagem,* it is said, in six weeks. Farquhar is one of the finest of our comic dramatists, although Pope called him a 'farce writer.' Less brilliant than Congreve, he possessed more warmth and a wider range of character. He had wit in abundance, but he had humanity too. As a man he was tender-hearted and somewhat given to melancholy. Consult *Dramatic Works,* edited, with *Life,* by Ewald (London, 1892).

FARQUHAR, Norman von Heldreich (1840 —). An American naval officer, born at Pottsville, Pa. He graduated at the United States Naval Academy in 1859, was assigned to the squadron stationed off the African coast for the suppression of the slave trade, and during the Civil War served in the North Atlantic blockading squadron. He participated in both attacks on Fort Fisher, was commissioned lieutenant-commander in 1865, became commodore in 1897, and subsequently rear-admiral. He was in command of the *Trenton*, of the Pacific Station, when that vessel was wrecked during the great hurricane at Apia, Samoa (March 16, 1889). In 1889 he was appointed to the Lighthouse Board, in 1890 became chief of the bureau of yards and docks in the United States Navy Department, and in 1899 commander of the North Atlantic Station.

FARQUHARSON, fär′kwẽr-son, Martha. See Finley, Martha.

FARR, William (1807-83). An English statistician. He was born in Shropshire, was educated at the universities of Paris and London, and afterwards gave his attention to medical statistics. A registration of deaths and their causes was commenced in England in 1837, and two years later Farr was made superintendent of the statistical department. A selection from his works, under the title *Vital Statistics,* was published in 1885. In addition, he published many essays and monographs on statistical subjects.

FARRAGUT, făr′*a*-gŭt, David Glasgow (1801-70). The most famous of American naval officers. He was born at Campbell's Station, near Knoxville, Tenn., on July 5, 1801, the son of George Farragut (1775-1817), a native of Minorca, who had emigrated to the United States in 1776, and had taken an active part in the Revolutionary War. In 1808 the future admiral was adopted by Commander (later Commodore) Porter, and in December, 1810, entered the navy as a midshipman. He was assigned to the *Essex* (Captain Porter) in the same year, accompanied this vessel on its famous cruise in the Pacific (1812-14), and on March 28, 1814, distinguished himself in the bloody battle with the English vessels the *Phœbe* and the *Cherub.* He then served successively on the *Independence* and the *Macedonian,* in the Mediterranean (1815-17); studied for nine months under Charles Folsom, United States consul at Tunis; became acting lieutenant on the *Shark* in 1819; was placed in command of the *Ferret* in 1823, and in 1825 became lieutenant on the *Brandywine.* For the next twelve years he served in subordinate capacities on various vessels and in various parts of the world, but in 1838 was placed in command of the sloop *Erie*, and in 1841 was raised to the rank of commander. During the Mexican War he commanded the sloop-of-war *Saratoga*, in Commodore Perry's squadron, and maintained a strict blockade of the port of Tuxpan. He was on duty at the Norfolk (Va.) Navy Yard from 1848 to 1850, when he went to Washington to help compile a book of ordnance regulations for the navy, and from 1854 to 1858 was engaged in establishing the Mare Island Navy Yard, in San Francisco Bay. In 1858-59 he was commander of the sloop-of-war *Brooklyn*, and in 1860-61 was again stationed at the Norfolk Navy Yard. Though bound to the South by birth and by the strongest of family ties, he remained steadfastly loyal to the Union at the time of the Civil War, and when Virginia seceded he removed from Norfolk to Hastings-on-the-Hudson, and offered his services unreservedly to the Federal Government. He served for several months on the Naval Retiring Board, but in December, 1861, was put in command of the West Gulf blockading squadron of seventeen vessels, which, with a mortar flotilla of twenty-five vessels, under Commander (later Admiral) David D. Porter (q.v.), was ordered to effect the capture of New Orleans. On April 18, 1862, the mortar flotilla opened fire on Forts Jackson and Saint Philip, which, facing each other across the Mississippi, guarded the approach to the city; but the bombardment made comparatively little impression, and on the 24th Farragut ran by the forts under a terrific fire (his flagship the *Hartford* suffering considerable damage), avoided the fire-rafts sent against him, and with the loss of a single vessel (though three had been forced to put back), completely destroyed a Confederate fleet of thirteen gunboats and two ironclads. (See Fort Jackson and New Orleans.) On April 27th he took formal command of New Orleans, which was almost immediately occupied by Federal troops under Gen. B. F. Butler (q.v.). On June 28, 1862, a part of his fleet passed the batteries of Vicksburg with slight loss, and a few weeks later repassed them. On March 14, 1863, Farragut succeeded in running by Port Hudson with the *Hartford* and one other vessel, and, controlling the river between Port Hudson and Vicksburg, rendered essential aid to the land forces in the campaigns against those strongholds. In 1864 he was placed in command of a fleet of twenty-five vessels and ordered against Forts Morgan and Gaines at the entrance of Mobile Bay. These he attacked at daylight on August 5th. Advancing in the face of the enemy's torpedoes, one of which sank the *Tecumseh,* he silenced the forts with a fierce bombardment, passed into the harbor, and there destroyed a Confederate fleet consisting of an ironclad ram and four gunboats. (See Mobile Bay.) He was raised to the rank of rear-admiral in July, 1862, to that of vice-admiral in December, 1864, and to that of admiral in July, 1866, the latter two grades having been expressly created for him by Congress. He made a long cruise in European waters in 1867, and subsequently visited California. Early in 1870 he went to Portsmouth, N. H., where, on August 14th, he died. The authorized biography is that by Loyall Farragut, his son (New York, 1879); and Captain A. T. Mahan has written an excellent life from the standpoint of a naval expert for the "Great Commanders Series" (New York, 1892). Consult also a brief biography by Barnes (Boston, 1899).

FAR′RAND, Livingston (1867—). An American psychologist and author. He was born at Newark, N. J., and was educated at Princeton and Columbia universities, and later studied at Cambridge (England) and Berlin. In 1893 he was appointed instructor of psychology at Columbia University. His publications on psychology and anthropology are based largely upon independent researches.

FAR′RANT, Richard (c.1530-85). A composer of English Church music. He was organ-master of the choristers at Saint George's Chapel, Windsor, and in 1569 became gentleman of the Chapel Royal. Among the most admired of his compositions are the anthems "Call to Remembrance" and "Hide Not Thou Thy Face" in the collection of Barnard and Boyce. The beautiful anthem credited to him, "Lord, for Thy Tender Mercy's Sake," is probably by a composer of an earlier date.

FAR'RAR, Eliza Ware (Rotch) (1791-1870). An American author. She was born in Flanders, while her parents were traveling in Europe. She became well known as the author of *The Children's Robinson Crusoe, The Story of Lafayette,* and *The Life of Howard. The Young Lady's Friend* (1837) also was exceedingly popular. Her later years were spent in Springfield, Mass. She married Prof. John Farrar of Harvard College.

FARRAR, Frederic William (1831—). A distinguished English clergyman, born at Bombay, India. He studied at the University of London and at Trinity College, Cambridge, was ordained deacon in 1854, and priest in 1857. For several years he was an assistant master at Harrow, and from 1871 to 1876 was head-master of Marlborough College. In 1876 he was appointed a canon of Westminster Abbey and rector of Saint Margaret's. He became Archdeacon of Westminster in 1883, chaplain of the House of Commons in 1890, and Dean of Canterbury in 1895. He was Hulsean lecturer at Cambridge in 1870, Bampton lecturer at Oxford in 1885, and in the latter year visited the United States. A popular figure among the English clergy, he has been prominently connected with numerous philanthropic enterprises. His literary work is extensive and varied, including volumes of fiction, philological and theological studies, commentaries, biography, history, and didactic treatises. From a long list of titles may be cited *Eric* (1858); *The Origin of Language* (1860); *Chapters on Language* (1865); *A Lecture on Public School Education* (1867); *Essays on a Liberal Education* (2d ed. 1868); *Seekers After God* (1869); *The Witness of History to Christ* (1871); the Hulsean Lectures for 1870; a much-read *Life of Christ* (2 vols., 1874; 12th ed. in the same year); a *Life of Saint Paul* (1879); *The Early Days of Christianity* (2 vols., 1882); *Eternal Hope* (1888), in refutation of the extreme doctrine of eternal punishment; *The Bible, its Meaning and Supremacy* (1897), an investigation of the subject of inspiration; *Texts Explained* (1899); and *The Life of Lives* (1899).

FARRE, fär, Jean Joseph (1816-87). A French general, born at Valence (Drôme). He commanded the pioneer corps in the army of occupation at Rome in 1859. Upon the outbreak of the Franco-German War he was director of the fortifications of Arras, and after the downfall of the Empire he was intrusted with the organization of the force in the northern departments, which subsequently formed the divisions commanded by General Bourbaki. Farre succeeded to the chief command of the three divisions of the Army of the North on November 19, 1870. He was, however, compelled to abandon his defensive position before Amiens by General Manteuffel (November 27), and was succeeded by General Faidherbe. In 1875 he was appointed general of division, and in 1880 became Minister of War, in which position he removed all prominent officers suspected of favoring the Legitimist or the Bonapartist cause. But his appointments, as well as preparations for the war against Tunis, proved so unsatisfactory that he was superseded (November 14, 1881).

FAR'REN, Elizabeth (1759-1829). A noted English actress, who became in 1787 Countess of Derby. She was the daughter of an itinerant actor named George Farren, and appeared upon the stage when a child. About 1774 she obtained an engagement under Younger, at Liverpool, where she first played Lady Townley in *The Provoked Husband.* She first appeared in London at the Haymarket in 1777, taking the part of Miss Hardcastle in *She Stoops to Conquer.* In the fall of 1778 she appeared at Drury Lane, where she became established at first in tragedy, and, after the departure of Mrs. Abingdon in 1782, as leading lady in comedy. She was very popular, Charles James Fox being one of her admirers. She is best known for her impersonations of fine ladies in the comedy of high life. Among her favorite parts were Clarinda in *The Suspicious Husband,* Lady Betty Modish in *The Careless Husband,* Lady Emily Gayville in *The Heiress,* Julia in *The Rivals,* and Lady Teazle in *The School for Scandal.* In this last rôle she made her final appearance April 8, 1797. She had previously been received in aristocratic society, and on May 1st of that year she was married to the Earl of Derby, who had long been devoted to her. She died at Knowsley Park, Lancashire. Boaden's remark upon her career is well known, that after her retirement comedy degenerated into farce. There is a somewhat coarse work called *Memoirs of the Present Countess of Derby, Late Miss Farren,* by "Petronius Arbiter" (London, 1797), to which two crude responses were published by more friendly pens. Consult: Geneste, *History of the Stage* (Bath, 1832); Doran, *Annals of the Stage,* ed. by Lowe (London, 1888); Galt, *Lives of the Players* (London, 1831); and Lowe, in *Actors and Actresses of Great Britain and the United States,* ed. by Matthews and Hutton (New York, 1886).

FARREN, William (1786-1861). An English actor, famous especially for his acting of old men's parts in high comedy. He was the son of a prosperous actor of the same name, who lived in London, but he made his début at Plymouth, under his brother's management. For some time thereafter he lived in Dublin, till in 1818 he came to London and made his appearance at the Covent Garden Theatre, as Sir Peter Teazle. His Lord Ogleby, Sir Anthony Absolute, and Sir Andrew Aguecheek followed soon after. Having left Covent Garden in 1828, he appeared for a number of years at Drury Lane, where, in addition to some of his earlier favorites, he added the parts of Polonius, Sir Francis Gripe in *The Busybody,* Kent in *King Lear,* and numerous others. About 1840 he became one of the managers of the Haymarket, where he had occasionally played before, and there in 1843 he produced his Old Parr, an extraordinary depiction of old age. From 1850 to 1853 he was lessee of the Olympic Theatre. His farewell appearance was at the Haymarket in 1855. He was of distinguished appearance and unusual power of facial expression; some critics noted in him a lack of personal sympathy, which showed itself as well in private life. Though in his later years upon the stage, he was in feeble health, his success in his familiar characters seems to have been but increased. His Grandfather Whitehead was one of the parts for which his own advance in age as well as the practice of his art contributed to fit him. His sons, Henry (c.1826-60) and William, often referred to as Young Farren, both became well-known actors. Consult: Lewes, *On Actors and the Art of Acting* (New York, 1878); Cook, *Hours with the Players* (London, 1881); and Marston, *Our Recent Actors* (London, 1890).

FAR′RER, Henry (1844—). An American painter and etcher, born in London, and a grandson of Thomas Farrer, the miniature painter. He was self-taught. He came to America in 1861, and first devoted himself to marine and landscape painting in water-color. But he is better known by his etchings. The best of these are views about New York Harbor, in which his treatment of sky is very successful. His brother Thomas Charles (c.1838—), an English architectural and landscape painter, was born in London and studied in Ruskin's free school. He spent some time in the United States, and was one of the first members of the American Water Color Society. Afterwards he settled in London.

FARRIER (obsolete *ferrier*, from OF. *ferrier*, from Lat. *ferrarius*, blacksmith, from *ferrum*, iron). One whose occupation is that of shoeing horses. In former times he often acted as veterinary surgeon as well as blacksmith. His vocation is one of the 'common callings,' and subjects him to the common-law obligation of practicing his art on demand and of showing ordinary skill in it. For failure to discharge this obligation he is liable to an action for damages. He has at the common law a right of lien for labor done or expenses bestowed upon an animal.

FARSAN (fär-sän′) **ISLANDS.** A group of islands in the southeastern part of the Red Sea about 35 miles off the west coast of Yemen, in latitude 16° 30′ to 17° N. and longitude 41° 45′ to 42° 10′ E. (Map: Asia, D 7). They comprise the two larger islands of Farsan Seghir, 18 miles long, and Farsan Kebir, 25 miles long, with a number of islets and reefs. They are centres of important pearl and coral fisheries. On one of the islands there is a coaling station belonging to Germany.

FARSISTAN, fär′sē-stän′, or **FARS**, färs (Pers., Land of the Persians, anciently *Persis*). A province of Persia, situated along the east shore of the Persian Gulf (Map: Persia, D 5). The surface rises gradually from the coast to an elevation of from 2000 to 3000 feet. The valleys in the interior are well watered and exceedingly fertile. East of this hilly district, in the midst of a flat, sandy region, lies the large salt lake Bakhtegan. The chief rivers are the Sefid Rud, Mand, and Bendemir. The climate is not unhealthful, except along the coast, where it is very hot in the summer. The province produces tobacco, wine, rice, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. The principal towns are Shiraz, the capital, and Abushehr, the principal port. About thirty miles north of Shiraz lie the ruins of the ancient city of Persepolis. The natives are dolichocephalic, and represent one of the best preserved types of the Aryan of the Iranian plateau, being fairer-skinned and more finely formed than the population generally. See Persians.

FARUKHABAD, fŭr′rŭk-hȧ-bäd′, or **FURRUCKABAD.** A city of the Northwest Provinces, British India, 87 miles northeast of Cawnpore by rail (Map: India, C 3). It stands near the right bank of the Ganges and is a handsome, cleanly place, 570 feet above the level of the sea, with a considerable trade. It is the capital of the district of Farukhabad, although the manufacturing and military cantonment of Fathigarh, three miles east, which is joined to its municipality, is frequently so designated. Population, in 1891, 78,000; in 1901, 62,900.

FASANO, fȧ-sä′nō. A city in South Italy, near the Adriatic, 45 miles northwest of Brindisi (Map: Italy, M 7). The city hall is a former palace, with a handsome loggia (1509) of the Knights of Saint John. Two miles north of Fasano, which markets wine and oil, are the ruins of Egnatia, in Roman days a prosperous port, because the Appian Way touched the sea here. The ancient walls have been nearly all used by the peasants as material for the cottages of the modern Anazzo, and the wealth of vases, jewelry, coins, etc., has gone to stock museums elsewhere. Population of commune, in 1881, 17,012; in 1901, 16,848.

FASCES, făs′sēz (Lat., bundles). Bundles of rods usually made of birch, but sometimes of elm, with an axe projecting from the middle of them, which were carried before the chief magistrates of ancient Rome as symbols of their power over life and limb. They were borne by the lictors, at first before the kings; in the time of the Republic, before consuls and prætors; and afterwards before the emperors. Their number varied, a consul having twelve, and a prætor six, but within the city only two. Valerius Publicola introduced a law that within the city the axe be withdrawn, except in the case of a dictator, who was preceded by twenty-four lictors, bearing as many fasces. Publicola also required that the fasces be lowered at the assemblies of the people, as an acknowledgment of their supreme power.

FASCH, făsh, Karl Friedrich Christian (1736-1800). A German musician, important as having been the founder of the Berliner Singakademie. He was born at Zerbst, where his father was Court kapellmeister. He developed early considerable musical ability, and in 1756 became cembalist to Frederick the Great at Berlin. From 1774 to 1776 he was kapellmeister of the opera in Berlin, but after that he retired and devoted himself to composition. His Church music was published in six volumes (1839), and a biography of Fasch was written (1801) by his successor Zelter. For the history of the Singakademie, see Choral Societies.

FASCIA, făsh′ĭ-ȧ (Lat., fillet). In architecture, a flat space or band, like a broad ribbon, wider than a fillet (q.v.). This name is given to the divisions of the Ionic architraves, and architraves are called single, double, or triple fasciæ architraves, according to the number of fasciæ into which they are divided.

FASCIATION (Neo-Lat. *fasciatio*, from Lat. *fascia*, fillet). A deformity of plants, common in shoots, which become several times as broad as usual, fluted, and often curved edgewise in crozier-like fashion. Fasciation is especially likely to occur in rapidly growing stems which are abundantly supplied with both water and food. See TERATOLOGY.

FASCINATION (Lat. *fascinatio*, from *fascinare*, to charm, from *fascinus*, witchcraft) BY SERPENTS. A power has long been popularly ascribed to serpents, or at least to some kinds of them, of fascinating by their eyes the small animals on which they prey so as to prevent the escape of the intended victim, and to cause it rather to run or flutter into the mouth which is open to devour it.

As an explanation of this conduct mesmeric or hypnotic influence has been suggested, but the whole matter is now regarded as exaggerated and to a great degree fabulous. It seems that when anything really resembling such actions occurs it should be ascribed to fear so intense that the animal becomes stupid, or loses its powers of coördination, is 'paralyzed by fright,' as the saying is. Animals respond in just these same ways when much frightened by other causes than serpents. Thus horses and other animals when actually rescued from floods or fire have been known to rush back again to their doom, or else they are too terrified to move when an exit is possible to them.

FASCINES, făs-sēnz′ (Fr., from Lat. *fascina*, bundle, from *fascis*, bundle). Fagots of brushwood or similar material, bound together, with wire if possible, and used in the construction of temporary field works, construction of levees, jetties, breakwaters, preparing foundation in marshes, and sometimes for setting fire to an obstruction. Fascines average about 12 feet in length, but vary according to the object for which they are constructed. They are about a foot in diameter. See FORTIFICATION.

FASHER, fä′shẽr, EL. See EL FASHER.

FASHION. The style of a brief epoch. The term is ordinarily applied to matter of dress, and will be thus treated in this article; but it also indicates an ephemeral taste for any object.

The distinction, then, between costume and fashion, or fashionable dress, depends on permanence of taste. If we visit Munich in the season of some one of the great popular fairs, the men and women of the Dachauer Moos and of the country around the Starnbergersee, as well as people from the Bavarian mountains, which are a part of what we call the Tyrolese Alps, will appear in the city with hats, coats, decorative suspenders for their breeches, short breeches, barred and striped stockings and conical hats; the women wearing head-coverings of indescribable kind not seen elsewhere in Europe, and an arrangement for their short black skirts, very difficult to describe, sometimes founded on a hoop-like structure, not at the hips, as in the fashionable farthingales and paniers of the eighteenth century, but above them, just at the waist. These are costumes. Ugly as many of them are, they are ancestral, dating from old time, and but slightly modified, at least in the nineteenth century, and in a sense unconscious—that is to say, the people of a given village have never known and do not dream of wearing garments of another style than these. At the same time the ladies of Munich are wearing garments based upon the Parisian style of the same season or of the season immediately preceding, and the men of this same class of society are wearing partly English and partly French dress, the coats and trousers, hats, and the rest being closely imitated from one or the other of these models. The style of these garments for both women and men varies from year to year and from season to season, not only in the shape of the garment and the fashion of its tailoring or dressmaking, but also in the material itself of which they are composed. It will be as rare at a certain time to see a black frock coat as it will be a few years later to see a blue one, and the changes in women's dress in the colors used and even in the character and intensity of the colors varies very greatly, usually changing slowly for a few seasons and then changing much more decidedly into a new style. This is fashion. But the dress of the country people is costume.

The fashions are nearly the same throughout western Europe and in the United States of North America; that is to say, the dress of the most wealthy class is nearly the same in all; that of the class of employees, people of moderate means not capable of indulging every fancy, follows at a slower pace, and therefore the dress of a French clerk will differ somewhat from that of an English clerk, and again from that of a man on a proportionately small salary in New York. Some few little peculiarities cling to the people of a nation or a city for a number of years, such as, for instance, the loose and long silk bow worn as a necktie, so common in the north of France, but rarely appearing in other countries except as worn by Frenchmen on their travels. These peculiarities, so far as they go, partake of the nature of costume. Some other peculiarities are merely attempts as it were of fashion which have failed to be universal. Thus, although American gentlemen generally wear hats of London form, there have been several epochs during the past fifty years when the London hat was very much higher in the crown and more aggressive than any of those worn in America.

It has been thought right, then, to discriminate carefully between the costume of Europe during the years following the French Revolution (see COSTUME) and fashion, which for Europe makes up the more notable record of the nineteenth century, as being associated with the governing and more influential classes. The wear of women has not deviated from the gown and hat with the other garment for street wear called by various names; and for men continuously coat and waistcoat and trousers; but these have varied in detail. In 1830 and in following years (reign of Louis Philippe) the frock coat was worn with skirts not very long, but cut so as to spread very widely, so that when the garment was worn buttoned it was extremely dressy in appearance, fitting the body closely and having a very appropriate fullness where it covered the hips. At the same time the dress coat worn for occasions of some ceremony and by elderly men who felt themselves of importance in the world had very broad skirts and was capable of being buttoned across the breast. These were the fashions in France, and to a great extent in England, though the cut of the frock coat was different there. These garments were of blue, claret-color, bright brown, and other decided colors, and the fashion lingered on in the United States to 1850 or thereabout, at which time a person continuing to wear the colored cloth of a former generation was remarked upon. As late as 1850 many gentlemen of middle age wore a blue dress coat buttoned up with large flat gilt buttons, a white waistcoat, and black, close-fitting trousers, the form which had replaced the far more graceful and dignified *pantalon;* for which see Costume. The women of 1840 and thereabout wore a very reasonable and pleasant costume. The waist of the dress was so made as to be distinctly a bodice, separate from the skirt in make, if not of a different material; the skirt was very loose and full at the top and fell in ample folds, or if of thinner material, floated softly; altogether it was a very perfectly imagined and satisfactory gown. This was the immediate successor of the close-fitting garment of the Empire mentioned under Costume. These gowns in some of their many modifications lasted until the time of the crinoline or haircloth skirts, which were immediately succeeded by the hoopskirts or skirts made of metal springs, all these being used to expand and support the skirt of the gown, so that the dress of women from about 1850 until the sudden disappearance of the hoops in 1866 was in a sense grotesque. It was costly and bulky, unnatural in that it did not follow the lines of the body at all, and ugly because it swung in one stiff mass instead of falling in folds, and sometimes involved disagreeable exposures. After the bell-shaped hoopskirts, in which the form sometimes affected a hemisphere, from which the body of the women above the waist seemed to rise like the handle of a bell, there came in the hoops of another form, which clung close to the hips and spread widely below. These hoops soon again disappeared, and the skirts became once more somewhat like those of the years before 1850, though not so full.

The later years of the nineteenth century would be more difficult to follow in detail than those of any other epoch known to us, and this on account of the number of different styles of dress worn by women of means during the same day, or at least the same week. The rage for out-of-door sports, and exercise of different sorts calling, as it is thought, for garments of peculiar cut and even of peculiar material, multiply the number of gowns and other garments which a woman of elegance has in use in one time. The fashion covers all these alike; and the dress of the morning at home, that of the afternoon at home, that of the tennis court, or of the golf-links, that of riding, that of driving, that of the dinner party and that of the evening entertainment, that of the theatre and that of the concert differ very widely from one another, while at the same time they are in the fashion. For information about fashion before the nineteenth century, see Costume, and consult the authorities there referred to.

FASHION, Sir Novelty. A fop in Colley Cibber's *Love's Last Shift.* He is the original of Lord Foppington in Vanbrugh's *The Relapse.*

FASHION, Tom. In Vanbrugh's *The Relapse* and in Sheridan's *A Trip to Scarborough,* the younger brother of Lord Foppington. He marries the heiress, Miss Hoyden, by impersonating his brother.

FASHIONABLE LIFE, Tales of. A series of stories by Maria Edgeworth, of which three volumes appeared in 1809 and three in 1812. The tales are "Ennui," "The Dun," "Manœuvring," "Almeria," "Vivian," "The Absentee," "Madame de Fleury," and "Emilie de Coulanges," the best being "Vivian" and "The Absentee."

FASHODA, fȧ-shō′dȧ. A town of Egyptian Sudan, situated in an unhealthful region on the White Nile, in latitude 9° 53′ N. and longitude 32° 7′ E. (Map: Africa, H 3). It was founded by the Egyptian Government in 1867, and was almost entirely deserted during the Mahdist uprising which broke out in 1881. A French expedition under Captain Marchand occupied Fashoda in July, 1898. After the victory of Omdurman in September of the same year the British Government demanded the evacuation of Fashoda by the French—a demand which was complied with only after protracted negotiation in consideration of commercial concessions in the region of the Upper Nile, and the extension of the French possessions in Central Sudan, so as to include the territories of Wadai, Baghirmi, Kanem, Tibetsi, Borku, and a part of the desert region. The Anglo-French convention of March, 1899, besides fixing the boundary line between the British and the French possessions in North Africa, also provides for commercial equality for all nations in the region lying between Lake Chad and the Upper Nile.

FAS′SETT, Cornelia Adèle (Strong) (1831-98). An American artist, born at Owasco, N. Y. She studied in water-color in New York, in oils in Paris and Rome, and in 1855 established in Chicago, Ill., a studio which she removed in 1875 to Washington, D. C. She was elected to the Chicago Academy of Design in 1873. Her works include portraits of President Garfield, Associate Justice S. J. Field of the Supreme Court, Clara Barton, and Gen. J. A. Logan, and the large canvas, "The Electoral Commission in Open Session" (1877-80), bought by the Government for the Capitol.

FASSETT, Jacob Sloat (1853—). An American lawyer and politician. He was born at Elmira, N. Y.; graduated at Rochester University in 1875, and soon afterwards was admitted to the bar. In 1879-80 he was district attorney of Chemung County, and in 1880-81 studied constitutional law and political economy at Heidelberg University, Germany. From 1884 to 1892 he was a member of the New York State Senate, of which he was also president from 1889 to 1891. He was secretary of the Republican National Committee from 1888 to 1892, and in 1891 was the candidate of that party for Governor of New York, but was defeated. He was temporary chairman at the Republican National Convention at Minneapolis in 1892.

FAST (AS. *fæsten,* Icel. *fasta,* Goth. *fastubni,* OHG. *fasta,* Ger. *Fasten,* fast, from AS. *fæstan,* Icel. *fasta,* Goth. *fastan,* OHG. *fastēn,* Ger. *fasten,* to fast; probably connected with AS. *fæst,* Icel. *fastr,* OHG. *fasti, feste,* Ger. *fest,* fast, firm). A term used to express either total abstinence from meat and drink, or at least a certain restraint in respect of food. As a religious custom, fasting seems to have originated in the conceived necessity of proper preparation for communion with the ancestral spirits in the sacrificial meal and in the ecstatic state. It was thus a sacrifice offered to the Divinity, the acceptance of which was indicated by permission to partake in the sacrificial banquet and by the vision vouchsafed to the devotee. Hence its universal occurrence in some form in all religions and among common worshipers as well as among the religious leaders. It has been observed wherever ancestral worship has flourished, even though there was no marked tendency toward mysticism, and has not only maintained itself, but has developed especial intensity as a means of inducing an extraordinary psychical receptivity to spiritual impressions in monotheistic and pantheistic forms of religion otherwise preserving only slight traces of their animistic origin. The reduced vitality and increased nervous excitability occasioned by lack of proper nourishment have tended to produce a mental condition favorable to the seeing of visions and the hearing of voices, necessarily interpreted as objective realities. By curbing the appetites and the passions, they have served as means of moral discipline. On the other hand, the reaction has added joy and exhilaration to the following communion with the Divinity. See FESTIVALS.

The custom prevailed among the Aztecs and Toltecs of Mexico, the Incas of Peru, and other American aborigines. It has been found among the Pacific Islanders, who occasionally use strong purges before venturing to eat holy meat. In China and Japan there are possible traces of it before contact with Buddhism; and it has been kept in eastern Asia wherever Brahmanism and Buddhism have spread. If the climatic conditions of India forced attention to dietary rules, the introspective attitude of her people naturally led to observation of the effects upon the mental activities of abstinence from food. Insensibility to pain, clairvoyance, attainment to a higher superconscious state, absorption in the divine, seemed the rewards or results of a patient endurance. Already in the Yajur-Veda period this estimate of the value of fasting becomes apparent, and it is still widely prevalent in all parts of India. In the Mithras cult, a mixture of Iranian and orgiastic elements, it was a necessary preparation for initiation into the mysteries. As this faith spread over Armenia, Cappadocia, Pontus, and Syria, the importance of the already existing religious custom was everywhere enhanced. It was indeed a characteristic requirement made by mystic cult societies in many lands. At least as early as the seventh century B.C. the Orphic societies in Greece demanded total abstinence from meat and beans, and subsequently the highest rites in the Eleusinian mysteries were preceded by a day of fasting. Similarly, fasting was required previous to initiation in the mysteries of Isis and Osiris, while in earlier time it does not seem to have been widely observed in Egypt, though it is known through Herodotus that at Busiris a fast preceded the sacrificial meal. The Romans also to some extent practiced fasting in connection with their festivals, and in later times before initiation in cult societies.

It is not certain that the Babylonians kept the custom; and the story of the fast in Nineveh (Jonah iii. 5 sqq.) merely shows that the late Jewish authors took for granted that the Assyrians fasted to avoid a great national calamity, though they may have been quite right in this assumption. In Israel, fasting was, in earlier times, spontaneous and not regulated by law. The purpose appears to have been to arouse Yahweh's pity (II. Sam. xii. 22), to avert national calamity (I. Sam. vii. 6), to express sorrow for the dead (I. Sam. xxxi. 13), to prepare for a sacrificial meal (I. Sam. xxi. 5), or to render a man fit for a special revelation (Ex. xxxiv. 28; Deut. ix. 9, 18). After the Exile, days of public fasting were instituted. They are first mentioned in Zech. viii. 19, where the fasts of the fourth, fifth, seventh, and tenth months are referred to and the question whether they should be observed is discussed. These fasts were ordained in commemoration of the misfortunes that had befallen Jerusalem, viz. the capture of the city on the 9th of Tammuz, the destruction of the temple on the 9th of Ab, the murder of Gedaliah on the 3d of Tishri (Jer. xli. 2), and the beginning of the siege on the 10th of Ab. The only day set apart for fasting in the Mosaic law is the tenth of the seventh month (Tishri). It is thought by modern scholars to have been instituted later than the four fast days previously mentioned. See ATONEMENT, DAY OF.

Still later is the observance of the 13th of Adar as a fast day. (See PURIM.) While the earlier prophets denounced the custom of fasting, the later prophetic writers seem to have regarded it as valuable. Prayer and fasting are often united, and the necessity of fasting as a preparation for divine revelations is emphasized (Dan. ix. 3; x. 2, 3, 12; IV. Ezra v. 13; vi. 31). The Pharisaic party practiced fasting on two days in the week, Monday and Thursday, though it is doubtful whether it ever was more than partial; the Essenes were led by their ascetic tendencies to attach much value to fasting, while the Sadducees, more conservative in such matters, did not go beyond the fast days prescribed in the law. As the Babylonian exile, rendering sacrifices impossible for a time, led to a development of fast days, so the misfortunes that in later times have befallen the Jewish people have occasioned the establishment of new fast days. These, however, have not become permanent. There are half days of fasting at the summer and winter solstices which may go back to earlier times; those before *Rosh Hashshana*, or the New Year's Day, and the Day of Atonement, seem to be later developments. Fasting is often prescribed on certain memorial days. An orthodox Jew fasts on his birthday after reaching the age of thirteen, and on the birthday of his first-born son till the latter reaches the age of thirteen, in commemoration of the sparing of the Israelite first-born in Egypt. The anniversary of the death of parents is also similarly observed. Fasting with the Jews always implies entire abstinence and lasts from daybreak till the appearance of the first three stars, except on the Day of Atonement and the 9th of Ab, when the period begins with sunset of the preceding day. Children, pregnant women, and the sick are exempted from the observance of fasting.

In the reported sayings of Jesus, He refers only twice to fasting. In Matt. vi. 16-18, He says: "When thou fastest, anoint thy head and wash thy face, that thou be not seen of men to fast," thus condemning all ostentatious fasting, and inferentially all public display of contrition. In Matt. ix. 14-17 and parallels, He answers the question why He and His disciples do not fast. All scholars are agreed that the strikingly original utterances concerning the new wine and the old bottles and the new piece and the old garment are genuine. Assuming the authenticity also of the remarks concerning the bridegroom who is to be taken away, Roman Catholic interpreters understand, not improperly, the words, "And then they shall fast in those days," to be a direct exhortation, and that the disciples were only exempted from fasting during the presence of their Master on earth. This must indeed have been the manner in which the words were apprehended in the early Church. But the genuineness of this saying is seriously questioned by competent critics, and it is most naturally understood as a justification of a practice not observed by Jesus Himself or His disciples in His lifetime, but subsequently adopted. It seems to be earlier than the story of His fast for forty days (Matt. iv.). These passages probably show that at the end of the first century fasting was quite generally observed in the Church. This is also shown by Acts xiii. 2, 3; xiv. 23; II. Cor. vi. 5; xi. 27, and the interpolations found in the received text of Matt. xvii. 21; Mark ix. 29; Acts x. 30; I. Cor. vii. 5. In the Oxyrhyncus fragment containing what claim to be the sayings of Jesus, He is represented as having said, "If ye fast not in respect of the world, ye shall not find the Kingdom of God." The language is probably to be taken figuratively, may be directed against physical fasting, and certainly does not come from Jesus. Fasting was required as a preparation for holy acts and feasts, for ordination and baptism. The forty hours between Friday afternoon and Sunday morning, commemorating the time when Christ lay in the sepulchre, were annually celebrated, and early fathers allude to the forty days of Lent as handed down and observed by the Church. The moral earnestness of the Montanistic movement found expression in vigorous fasting. (See MONTANUS.) While Wednesdays and Fridays had no doubt been observed by fasting before his time, Montanus emphasized the necessity of abstaining from all food on these days, and probably was the first to lay down definite rules concerning fasting. The growing Catholic Church was led by this movement to regulate more closely the matter of fasting and to grant certain relaxations. At the Council of Orleans (541), abstinence from meat during Lent, except on Sundays, was prescribed. The eighth Council of Toledo (633) declared those who ate meat during Lent sinners unworthy to partake in the resurrection. But the severe laws on this subject which prevailed in earlier times generally, and were made still stricter in the monastic rules (the Cistercians, for example, eating nothing at all until two o'clock in the afternoon), have been much relaxed in later days as a concession to the needs of modern complexity of life and severity of climate. To regulate the details of fasting has always been considered as within the authority of the Church: in George Herbert's phrase, "The Bible bids us fast—the Church says 'Now.'" Accordingly the power of dispensation is considered by Roman Catholic theologians to reside primarily and universally in the Pope, for practical purposes also in the bishops, and (for individual cases) in parish priests and confessors. Fasting is divided into the natural or absolute and total fast, which means entire abstinence from any sort of food or drink, no matter in how small quantities; the ecclesiastical or partial fast; and abstinence. The first only applies to the regulation for those who are to receive Holy Communion; it lasts from the previous midnight until after communion, and is never relaxed except in the case of the dying. The second allows only one full meal in the day, with a small collation in the evening, and two ounces of dry bread with the morning coffee or tea. The third does not regulate the quantity, but forbids the use of meat. Normally, all weekdays in Lent, the ember-days (q.v.) at the four seasons, certain vigils (q.v.), and in some countries the Wednesdays and Fridays in Advent, are observed as strict fasts under the above definition; but the regulations vary considerably in detail in different countries. Recently a dispensation granted for ten years and already once renewed allows the bishops of the United States to relax very much the Lenten fast for the working classes. Those who are under twenty-one or over sixty, the insane, sick, or convalescent persons, pregnant and nursing women, and those whose occupations are specially laborious or exhausting, are excused from fasting. Strictly, the prohibition of flesh-meat includes the products of the animals whose flesh is not to be eaten, as milk, butter, cheese, eggs, classed together as *lacticinia;* but in northern countries, at least, these are usually allowed, either by custom or express dispensation. The Roman Catholic Church regards fasting as a means of grace, under two aspects—that of the actual mortification and that of obedience to ecclesiastical precept.

In the Greek Church fasting is kept with much greater severity. The Easter fast lasts 48 days, that of Christmas 39 days, that in honor of the Virgin 14 days, and that of the Apostles begins on Monday after Trinity and extends to the 29th of June. There are also many vigils preparatory for great festivals. The Church of England considers fasting as praiseworthy, but not as obligatory, a useful exercise preparatory for the means of grace, but not itself one. The days named by the English Church as seasons of fasting are the forty days of Lent, including Ash Wednesday and Good Friday; the ember-days, the three rogation days, all the Fridays of the year (except Christmas Day), and the eves or vigils of certain festivals.

Mohammed commanded but one fast, viz. that during the month of Ramadan (see RAMADAN), although he recommended fasting at certain other times as a meritorious act. The fast of Ramadan is rigorously observed, at least in letter, by all Mussulmans. Whether fasting was practiced in Arabia before contact with Judaism or Christianity is doubtful. Certain of the fasts recommended by Mohammed seem to be imitations; that on the 10th of Muharram (see MUHARRAM), for instance, corresponds to the Day of Atonement on the 10th of Tishri.

Abstinence from food may cause a grave condition of the body, and may even endanger life. In an experiment upon an animal which was caused to fast for 13 days, the more important tissues lost the following percentages of dry solid matter: The adipose tissues, 97 per cent.; the spleen, 63.1 per cent.; the liver, 56.6 per cent.; the muscles, 30.2 per cent.; the blood, 17.6 per cent.; the brain and spinal cord, none. The tissues in general became more watery than in health.

As the amount of muscle lost during the fasting period contained about 15.2 grams of nitrogen, more than half the lost nitrogen came from metabolism of muscular tissue. Experience has taught that the weight of an adult's body may remain approximately constant for months or years, even under varying conditions of diet. Also, the relative proportions of the various tissues of the body remain constant, in addition to an unchanged weight. Evidently, in such cases, the expenditure of the body must precisely balance its income. If it did not lose as much nitrogen as it takes in, the body would gain in muscle. If it did not lose as much carbon as it takes in, it would put on fat. It may be losing or gaining carbon, losing or gaining fat, and yet the proteid constituents remain constant in amount, the expenditure of nitrogen being exactly equal to the income of nitrogen. This condition is called 'nitrogenous equilibrium.' In a fasting animal, while urea is excreted and carbonic acid is given off, the expenditure of nitrogen is very small. The glycogen and then the fat disappear, and, lastly, some of the proteid. But, as the figures given show, the heart and central nervous system are supported, and lose but little in weight, while other organs are sacrificed to feed them.

The results obtained from the study of fasting men differ a little from those in the case of starving animals. In men, the excretion of nitrogen diminishes continuously for several days. There is a diminution of the chlorine and urea in the urine, and an increase in phenol. The respiratory quotient sinks to a figure less than the one corresponding to oxidation of fats alone. The inference must be that some of the carbon of the disintegrated proteids is stored up in the body as glycogen.

After a certain period of fasting, fever, restlessness, and delirium generally set in. The delirium may be mild, with hallucinations of food and drink, or it may be furious. Age and obesity have a considerable influence upon the length of time life persists, in the face of actual starvation. A case is recorded, of the wreck of the frigate *Medusa* in 1876, when fifteen people survived without food on an open raft, for thirteen days. In the case of a convict, quoted by Bérard, life was sustained on water alone for sixty-three days. Eight miners survived five days and sixteen hours with almost no food. But, generally, death occurs in man after from five to eight days of total deprivation of food. Chossat states that death from starvation occurs after a loss of four-tenths of the weight of the body. Though there have been many alleged cases of fasting for thirty days, or even some years, by certain professional fasters or religious women, nothing of the sort could possibly have happened, impostures having thus been practiced invariably in every case. Dogs live from thirty to thirty-five days if deprived entirely of food and drink.

Hibernating animals (see HIBERNATION) are capable of sustaining the want of food for an apparently indefinite period of weeks during the winter sleep; but no warm-blooded animal can endure fasting in anything like the same degree as the reptiles—in many of which, indeed, the natural state of existence is one of long intervals between the times of taking food, and in which the vital change of texture is remarkably slow. Thus, the remarkable amphibious animal, the *Proteus anguinus*, has been known to live for years without food, and the same is true of salamanders, tortoises, and even goldfishes. In attempting the recovery of persons reduced by fasting, food must be given in very small quantities at a time, and of the most nourishing and digestible quality; stimulants should be either withheld or very cautiously administered. The most important point, next to the regulation of the food, and sometimes even before food is given at all, is the removal of the chill of the body by gradually applied heat; for, in addition to emaciation and arrest of secretion, the animal heat falls perceptibly during fasting.

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FAST AND LOOSE. The name of a cheating game, also called *pricking at the belt*, which appears to have been much practiced by the gypsies in the time of Shakespeare. The following is a description: "A leathern belt is made up into a number of intricate folds, and placed edgewise upon a table. One of the folds is made to resemble the middle of a girdle, so that whoever shall thrust a skewer into it would think he held it fast to the table; whereas, when he has so done, the person with whom he plays may take hold of both ends and draw it away."

FASTENRATH, fäs'ten-rät, JOHANN (1839—). A German writer, born at Remscheid. He studied at the universities of Bonn, Heidelberg, Munich, and Berlin, and in Paris; traveled extensively in Spain in 1864, 1869, and 1879; wrote several works of verse after the Spanish manner (*Ein spanischer Romanzenstrauss*, 1866; *Hesperische Blüten*, 1869; *Immortellen aus Toledo*, 1869); and in *Das Buch meiner spanischen Freunde* (1870) introduced to German readers the work of contemporary Spanish poets through translations of representative specimens. His *La Walhalla y las glorias de Alemania* (1872-87) performed a reverse service, describing for Spanish benefit, under the guise of interesting essays, prominent German characters from the days of Hermann. Numerous other original volumes and translations have in a scholarly manner familiarized in Germany much of Spanish literature and history.

FAS'TI (Lat. nom. pl., lawful, from *fas*, divine law, sc. *dies*, days). Among the Romans, the days on which it was lawful to transact business before the prætor; while the *dies nefasti* were those on which courts were not in session. The *dies comitiales*, on which the assembly and the Senate might convene, were also loosely styled *fasti*. The *nefasti* embraced the *dies religiosi* and the *feriæ* (holidays). Of the strict *dies fasti* there were some forty; of the *dies comitiales*, some one hundred and ninety; of the *dies nefasti*, about fifty; of the *dies religiosi*, some fifty. There were also eight *dies intercisi*, which for certain hours in the forenoon and afternoon were *nefasti,* and *fasti* for the rest; and three *dies fissi,* which were, like the *intercisi,* partly *fasti* and partly *nefasti.* The sacred books, in which the lawful days of the year were marked, were themselves denominated *fasti,* and the term was employed, in an extended sense, to signify various kinds of registers, which have been often confounded with each other. These registers fall into two principal divisions—the *Fasti Sacri* or *Kalendares,* and the *Fasti Annales* or *Historici.*

(1) *Fasti Kalendares,* or calendars of the year, were kept exclusively by the priests for about four centuries and a half after the building of the city. The appearance of the new moon was proclaimed by a pontifex, who then announced to the people the time which would intervene between the kalends and the nones. (See KALENDS, also CALENDAR.) On the nones the country people assembled for the purpose of learning from the *Rex Sacrorum* the various festivals of the month, and the days on which they would fall. In the same way those who intended to go to law learned on what days it would be right (*fas*) to do so. The mystery with which this lore was surrounded, for purposes of power and profit, by the favored class, was dispelled by Cn. Flavius, the scribe of Appius Claudius Cæcus, who surreptitiously copied from the pontifical book the requisite information, and published it to the people in the forum (B.C. 304). Henceforth time-tables (*fasti*) became common, very much resembling modern almanacs. They contained the days and months of the year, the nones, the ides, lawful and unlawful days, etc.; astronomical observations on the rising and setting of the fixed stars, the commencement of the seasons, brief notices concerning the introduction and signification of certain rites, the dedication of temples, the dates of victories, disasters, and the like. In later times the exploits and honors of the Imperial family were duly entered in the calendar. The celebrated *Fasti* of Ovid is a sort of poetical companion to the calendar, as published by Julius Cæsar, who remodeled the Roman year. Written in elegiac metre, they relate the origin of the festivals as told in the legends, and are important to the student of antiquities.

Several very curious specimens of *fasti* on stone and marble have been discovered, of which one of the most remarkable is the *Kalendarium Prænestinum,* the work of the learned Verrius Flaccus, which stood in the lower part of the forum of Præneste, described by Suetonius. Very interesting also are two farmers' almanacs (*menologia rustica*), now in the Museum of Naples. They are cut on four sides of a cube, each side of which is divided into three columns, each column embracing a month. The various agricultural operations to be performed in each month are given on these curious relics, in addition to the ordinary information contained in these calendars.

(2) *Fasti Annales* or *Historici* were chronicles containing the names of the consuls and other magistrates of the year, and an enumeration of the most remarkable events in the history of Rome, noted down opposite the days on which they occurred. From its application to these chronicles the word *fasti* came to be used by the poets as synonymous with historical records. A very interesting specimen of *fasti* of this class (*Fasti Consulares* or *Capitolini*) was discovered in the forum at Rome in 1547. It is a series of inscriptions on the marble walls of the Regia, dating from B.C. 36, and containing a fairly complete register of the consuls. The fragments into which it had been broken were collected and arranged by Cardinal Alessandro Farnese, and placed in the Capitol, where they may still be seen, together with some additional portions which were discovered in 1817 and 1818. The extant fragments of the *fasti* are published in the *Corpus Inscriptionum Latinarum,* vol. vi., part i. (Berlin, 1876). Consult Smith, *Dictionary of Greek and Roman Antiquities* (London. 1869).

FAST'NET LIGHTHOUSE. See CAPE CLEAR.

FAS'TOLF, Sir JOHN (c.1378-1459). An English soldier noted for his services in France during the last phase of the Hundred Years' War. He distinguished himself at Agincourt (q.v.), and still more at the "Battle of the Herrings," February 12, 1429, so called because, while conveying supplies to the English besiegers of Orléans he formed a sort of laager of herring-barrels, and with his archers beat off a much larger French army. On June 18th the united forces of Fastolf and Talbot were defeated at Patay by Joan of Arc. According to Monstrelet Fastolf displayed such cowardice that the Duke of Norfolk degraded him from the Order of the Garter, an honor which he had received in 1426. This, however, is very questionable, for he seems to have retained all his honors till his return to England in 1440. In 1441 he was granted a pension of £200. His Norfolk life is mirrored faithfully in *The Paston Letters,* where he is pictured as occupied busily in adding to his broad possessions, heaping up riches, building a huge new castle at Caistor—a hard old man, yet not without some love of learning and the Church. He died November 5, 1459. Attempts have been made to identify him with Shakespeare's Falstaff. Consult *The Paston Letters,* edited by Gairdner (London, 1872-75).

FATAL CHILDREN. A name given in early times to those children who were to bring evil to their parents, such as Œdipus, Perseus, etc. In mediæval days the term referred especially to children whose mothers died at their birth. Such an event was supposed to be an augury of the future fame but early death of the child. Volsung in the Teutonic myth and Tristram in the Arthurian romance were such children.

FATAL CURIOSITY. (1) The name given to a well-known story contained in Cervantes's *Don Quixote,* which narrates the temptation of a wife. (2) A bourgeois tragedy by Lillo, produced at the Haymarket toward the end of 1736. It is founded on a murder which occurred near Penryn, Cornwall, England, in 1618. It was revived by the elder Colman at the Haymarket, June 29, 1782; suggested Mackenzie's *Shipwreck,* and has served as the foundation of German plays by Moritz, Brömet, and Werner, produced in Berlin, 1781, Leipzig, 1785, and Weimar, 1810.

FATAL DISCOVERY, THE. A play by John Home, produced by Garrick February 23, 1769, at Drury Lane. Its characters are Ossianic. Its failure at the time was due to the fact that the author was secretary to the unpopular premier, Bute.

FATAL DOWRY, THE. A tragedy by Massinger, published in 1632, but probably written a number of years earlier. It was imitated by Rowe in his *Fair Penitent.*

FATALISM (from *fatal*, from Lat. *fatalis*, relating to fate, from *fatum*, fate, from *fari*, Gk. *φάναι, phanai*, to speak, Skt. *bhā*, to shine). The doctrine that the course of events is so determined that what an individual wills can have no effect upon that course. Fatalism must be carefully distinguished from *determinism* (q.v.), as the confusion of these two conceptions has been responsible for much of the popular prejudice existing against determinism. Fatalism, as has been said, denies that will has efficacy in shaping events; determinism in its scientific form asserts that will may and does shape events. Determinism maintains that this causally efficient will is itself to be causally accounted for; this is entirely different from the fatalistic assertion that will counts for nothing. In fact, determinism and fatalism are fundamentally antagonistic. Determinism asserts that events are determined by some of the events that immediately precede them; that if the latter were different the former would be different. Fatalism denies that immediately preceding events have anything to do with the origination of events immediately following; it asserts that the latter would occur even if the former were changed. The fatalist means, when he says that he is fated to die at a certain time, that no matter how much the intervening events may be altered the death will, nevertheless, occur at the predetermined moment. To say that one's death is fixed by fate is to deny that it takes place by natural law. Or, more accurately, it is to say that, however much one varies the cause, one cannot vary the effect. For instance, the fatalist soldier does not fear the battle, for he argues that at a fixed moment he must die; hence a mortal wound received in battle does not shorten his life. Should he escape the wound by avoiding the battle, he might be poisoned at that appointed time; should he escape the poison by due precaution, he might slip and crush his skull; should he avoid a fall by keeping quiet indoors, an assassin might attack him in his own apartments. Thus the death at an appointed hour is decreed, but not the particular means that shall bring it about. Hence the futility of the attempt to escape death; for such an attempt consists always in the avoidance of the *causes* of death, but to avoid one cause exposes one to another. It can now be seen that the fatalist's position is that the end is predetermined, but not the means; the determinist's position is that the events now occurring lead by causality to other events, which are thus fixed because their causes are actually existent. Or, to put it in still another way, for the fatalist what actually determines the event is not another event immediately preceding, but some mysterious decree issued by some mysterious agent ages before the event. This enables us to see that fatalism gives no scope to the will. But determinism, which merely asserts that every event has its determining conditions in its immediate antecedents, includes among the antecedents the human will, unless the determinism is of a materialistic type, and materialistic determinism is now generally discredited. (See MATERIALISM.) Thus determinism is consistent with a belief in the efficiency of will, and fatalism is not. Consult Mill, *Logic, Ratiocination, and Induction*, book vi., chapter ii. (London, 1884).

FATAL MARRIAGE, THE; OR, THE INNOCENT ADULTERY. A tragedy by Southerne (1694), founded on Mrs. Behn's novel *The Nun.* The underplot, omitted in Garrick's revival (1757), was drawn from Fletcher's *Night Walker.* The plot deals with the trials of a young girl, Isabella, who has unwittingly committed bigamy. Mrs. Barry created the leading rôle.

FATA MORGANA, fä′tȧ môr-gä′nȧ (It., fairy Morgana, who is supposed to cause the mirage). A striking kind of mirage observed in the strait of Messina and elsewhere in Italy. A spectator on the shore sees images of men, houses, ships, etc., sometimes in the water, sometimes in the air, the same object having frequently two images, one inverted. See MIRAGE.

FATA MORGANA. A fairy, the sister of Arthur and pupil of Merlin, called also "Morgaine la Fée" and "Morgue la Fay," represented in Boiardo's *Orlando Innamorato* as dispensing riches from her home at the bottom of a lake.

FATBIRD. See SANDPIPER; OILBIRD.

FATEHPUR, fŭt′ĭ-pōōr′. See FATHIPUR.

FATEHPUR-SIKRI, sĭk′rĭ. An ancient capital of the Mogul Empire, India, 23 miles east of Agra (Map: India, C 3). It is celebrated for its well-preserved remains of magnificent architectural works, among which are a mosque, several palaces, etc., inclosed by a stone wall, five miles in circuit. These date from 1570, and were built by the Emperor Akbar and his son Jehangir; but after the death of the latter the city was abandoned and the seat of power transferred to Agra. The small modern town of Fatehpur and its suburb Sikri, near the ruins, have a population of about 7000.

FATES. See PARCÆ.

FATHEAD. The most common of the bluntnosed minnows (*Pimephales promelas*), numerous all over the warmer parts of the United States. It is 2½ inches long, dusky-olivaceous, the head jet-black (in the male), and a black bar across the dorsal fin; but it is highly variable.

FATHER-LASHER (apparently from *father* + *lasher;* for *father*, in this usage, compare perhaps *daddy longlegs*). A small fish (*Cottus bubalis*), the most common and spiny of the British sculpins (Cottidæ), armed with strong spines on the back of the large head and on the gill-covers. It is brown above, whitish beneath, curiously marbled and spotted, the fins marbled black and white, and repulsive in appearance; its flesh is good, but little eaten in Great Britain. When touched it distends its gill-covers, sets out its spines, and assumes a very threatening appearance.

FATHER OF ANGLING. Izaak Walton, author of *The Compleat Angler.*

FATHER OF ECCLESIASTICAL HISTORY. The name given to Eusebius of Cæsarea.

FATHER OF ENGLISH CATHEDRAL MUSIC. A name generally given to Thomas Tallis or Tallys (1515-85), organist of Waltham Abbey, gentleman of the Chapel Royal, and composer of *Service in the Dorian Mode.*

FATHER OF ENGLISH POETRY. A title applied by Dryden to Chaucer.

FATHER OF ENGLISH PROSE. A title given to Roger Ascham.

FATHER OF EPIC POETRY. A name given to Homer, as the author of the *Iliad* and the *Odyssey.*

FATHER OF FRENCH HISTORY. André Duchesne, one of the earliest French historians.

FATHER OF GERMAN LITERATURE. A title applied to Lessing as the leader in reviving a national German literature.

FATHER OF GOOD WORKS. Sultan Mohammed II., of Turkey.

FATHER OF GREEK MUSIC. Terpander of Lesbos.

FATHER OF GREEK TRAGEDY. The title given to Æschylus.

FATHER OF HISTORY. The name given to Herodotus, as the first writer of real history.

FATHER OF JESTS. See Miller, Joseph.

FATHER OF LETTERS. (1) A title bestowed on Francis I. of France. (2) Lorenzo de' Medici.

FATHER OF LIES. Satan. The title has also been used of Herodotus, from disbelief in the stories he relates.

FATHER OF MEDICINE. A title given to Hippocrates.

FATHER OF MORAL PHILOSOPHY. A surname of Thomas Aquinas.

FATHER OF MUSIC. A name given to Palestrina.

FATHER OF ORTHODOXY. A title applied to Athanasius, Bishop of Alexandria, for his zeal in combating the Arian heresy.

FATHER OF PEACE. A title given to Andrea Doria, by the Genoese.

FATHER OF RIDICULE. A surname of François Rabelais.

FATHER OF THE FAITHFUL. A title given to Abraham, as the ancestor of the Jewish nation.

FATHER OF THE MARSHALSEA. William Dorrit, in Dickens's *Little Dorrit.*

FATHER OF THE PEOPLE. A title assumed by the kings of Denmark, and by Louis XII., Henry IV., and Louis XVIII. of France.

FATHER OF WATERS. A name given to the Mississippi River, on account of its great length and numerous tributaries.

FATHER PROUT. The nom-de-plume of Francis Mahoney (q.v.).

FATHERS, The Apostolic. The six fathers of the Church who were contemporaries of the Apostles: Barnabas, Clement of Rome, Hermas, Ignatius, Papias, and Polycarp.

FATHERS AND SONS. A novel by Turgenieff (q.v.), a presentation of theoretic nihilism.

FATHERS OF THE CHURCH. A title of honor applied to the early writers of the Christian Church. The name can be traced back to the fifth century, but its early significance is sometimes complicated by the habit of applying the title of father to bishops, especially when assembled in council. It is not applied to all the early writers without exception, as some of them, like Origen and Tertullian, who had fallen under suspicion of heresy, are not so designated. When the Church, by the declaration of either a general council or a Pope, has borne special testimony to the requisite qualities of orthodoxy, holiness, and eminent erudition, the formal title of 'Doctors of the Church' (q.v.) is given to such writers. The limitation of the period within which the name is applied has never been very precise; most commonly it is taken to end with the death of Saint John Damascene (c.754) for the Eastern Church, and with that of Saint Gregory the Great (604) for the Western. Consult: The best general collection, Migne, *Patrologiæ Cursus Completus* (387 vols., Paris, 1844-66), with the continuation. Horoy, *Medii Ævi Bibliotheca Patristica, sive Patrologia ab Anno 1216 usque ad Concilium Tridentinum* (Paris, 1879 seq.). The Vienna Academy is issuing (1866 seq.) a *Corpus Scriptorum Ecclesiasticorum Latinorum,* of a critical character. Translations of many Fathers may be found in the 'Ante-Nicene,' 'Nicene,' and 'Post-Nicene' libraries (New York, 1885 seq.).

FATHER TOM AND THE POPE, or A Night at the Vatican. An amusing broad satire by Samuel Ferguson, which first appeared in *Blackwood's Magazine* for May, 1838. The hero is generally supposed to have represented the Rev. Thomas Maguire, rector of a parish in Leitrim, and was afterwards introduced in Lever's *Harry Lorrequer* as Father Tom Loftus.

FATHIGARH, fŭt'ė-gär'. See Futtigarh.

FATHIPUR, FATEHPUR, or **FUTTEHPUR,** fŭt'ĭ-po͞or'. The capital of the district of the same name, in the Northwest Provinces, British India, on the great trunk road between Calcutta and Delhi, in latitude 25° 57′ N. and longitude 80° 54′ E., 70 miles northwest of Allahabad, and 50 miles southeast of Cawnpore (Map: India, D 3). It is a thriving place, with 20,000 inhabitants. Besides the buildings belonging to the civil establishment of the district, it contains a small but elegant mosque.

FATHOM (AS. *fæþm,* cubit, Ger. *Faden,* fathom, *faþu,* inclosure; ultimately connected with Gk. πεταννύναι, *petannunai,* to spread out). A measure of length equal to six feet. It was formerly ascertained by extending both arms and measuring to the finger-tips, and this method is still used by sailors in measuring short lengths of rope. In the United States, England, and Russia the measure is applied to depth of water and length of rope.

FATHOM, Ferdinand, Count. See Ferdinand, Count Fathom.

FATIGUE, få-tēg' (from Lat. *fatigare,* to fatigue; probably connected with *af-fatim,* enough). Fatigue usually follows long-sustained application, whether of mind or body. The distinction is often drawn between physical or bodily fatigue and mental fatigue. There is, however, a common element in the two. The mental experience which we call exhaustion or weariness is of one and the same kind, whether caused by prolonged muscular work or by sustained thinking. But it is customary to include in physical fatigue the altered condition of the muscles which renders them, for the time being, unfit for use. Thus we say that our arm or body is tired, or that we are 'tired all over.' Similarly there is sometimes included in mental fatigue the laxness of 'mental endeavor' and the increased inattention which follow upon hard study or the contention of diverse motives. These concomitants should, however, be kept distinct from the real experience of fatigue.

There is some disagreement among psychologists in regard to the ultimate analysis of fatigue. It is argued, on the one hand, that fatigue is a complex of more or less intensive organic sensations (q.v.), usually toned with pleasantness or unpleasantness, and even passing over into pain where the limit of endurance is approximated; while, on the other hand, it is urged that fatigue is as simple and unanalyzable as is the sensation of red or the tone of a tuning-fork. The truth seems to lie between the two views. As a rule many processes coöperate in the production of fatigue; but the experience itself is a fusion (q.v.), so close that it is impossible by introspection to wrench the constituent elements out of their union.

The experimental study of fatigue and of its effects, mental and physical, has been carried on with some success during the last twenty years by the continued efforts of physiology and psychology. The first comprehensive work was done by H. Kronecker of Bern and A. Mosso of Turin. The starting-point was the observation of the course of exhaustion in the muscle taken from the frog's leg. When the nerve supplying the muscle was stimulated at successive intervals by an electric current it was found that the contractility of the muscle suffered a constant decrement each time that the current was passed; until, finally, no movement at all was produced. If, however, the muscle were now thoroughly bathed with a weak saline solution, contractility was restored. This circumstance has led to the conclusion that at least part of the effect of fatigue lies in the accumulation of toxic materials, which prevent the contraction of the muscle. These materials are usually carried off in the blood; as is shown by the fact that the injection of blood from a fatigued into a normal animal gives rise in the latter to all the symptoms of exhaustion. An objective measurement of the effect of fatigue was made possible by Mosso's invention of the ergograph, an instrument which records the amount of work that a muscle, or rather a restricted group of muscles, performs in lifting a known weight, or pulling against a coiled spring. Many modifications of the instrument are now in use.

Over and above the action of poisonous materials, muscular fatigue is undoubtedly conditioned upon the exhaustion of the energy which is supplied by the blood in the form of nutriment. If the consumption of energy does not exceed the supply, and if the waste products are speedily renewed by the blood, fatigue of a muscle does not ensue. The heart, e.g. beats throughout the individual's lifetime without causing fatigue. Moreover, each muscle seems to have optimal conditions for work, which include an appropriate loading and a sufficient interval for rest between contractions. Whether the feeling of fatigue is aroused by the lack of nutriment in the muscle, or only by the poisonous waste products, is not definitely known. In any event, it is necessary to pass beyond the muscle, and to inquire into the immediate nervous conditions of fatigue. It is clear that a muscle could not feel fatigue, apart from a nervous system. The conducting nerve-fibres do not appear to be exhausted by fatigue; for they will continue to functionate for hours after the muscles have refused to contract. But the case is different with the nerve-cells of the brain. It has been found that these cells undergo serious alterations, both during artificial stimulation by electricity and during muscular exercise. Under exhaustion the cell-body becomes shriveled and the nucleus takes on a different appearance. It is fair to suppose that these changes are directly connected with the mental processes of fatigue.

If a muscle is so thoroughly exhausted that it refuses to respond to a voluntary effort at contraction, it may nevertheless continue to work, if it is electrically stimulated. And, on the other hand, voluntary contraction ensues when electrical stimulation is inefficient. It is difficult, however, to draw conclusions from these cases; for in either event some new muscular element is apt to be brought into function by the new source of stimulation.

Various methods have been devised for measuring the general intellectual fatigue which follows upon mental exertion. School children in particular have been subjected to tests for the determination of the fatigue-effects of various studies. Two types of method have been employed: (1) A period of instruction—e.g. the solving of simple problems in addition or multiplication—is made the test, and the extent of fatigue produced is determined by the amount of work done and the number of errors made. The results have shown a gradual increase in quantity in the latter part of the day's session, but at the same time a large increase in the number of errors. It is difficult to translate these results into terms of fatigue, because practice enters as a prominent factor. Further, the method does not give a fair test of the fatigue induced by regular school work, because the tests require an unusual tension, while at the same time their monotony renders them uninteresting and irksome, and invites carelessness. (2) Tests of the second type are introduced between the periods of study at various points in the day's work, e.g. at the end of every hour. The first of these methods is that of Griesbach. Two blunt compass-points are set down near together upon the skin, and gradually separated until the individual is just able to distinguish the points as two. This just discriminable difference of locality is called the limen for localization. (See EXTENSION; PSYCHOPHYSICS.) It has been found slowly to increase under fatigue. The limen varies so much, however, from individual to individual, with the time of the day, the degree of attention, and many other circumstances, that it is difficult to obtain significant results from the method. Another test is furnished by the 'memory method,' in which the pupil writes down a list of words previously read to him. The omissions and errors are taken as an index of fatigue.

Obviously the best test for fatigue will be one which involves the very processes which have been affected by work; hence it is necessary to make an analysis of the mental functions that are operative in ordinary school work, in order to determine the actual capacities which are drained by sustained application. Memory for words, e.g. may remain unimpaired, even though the individual is too fatigued for intellectual work;

i.e. memory may be more or less mechanical. Now, the essence of mental work is the sorting and weighing and unifying of material. It is a combining or synthetizing process. The great intellect is one that makes clear and comprehensive systems of the facts with which it deals; but it differs only in degree from the ordinary mind that plods through its tasks. An adequate test of mental fatigue is, then, a combining or constructive test. The most satisfactory one so far employed is that used in the schools at Breslau by H. Ebbinghaus. It consists in filling out mutilated texts. The individual is given a printed page, in which words, letters, and syllables are lacking, and is asked to reconstruct it so that it shall make sense. The complexity of the task is suited to the age and general capability of the student. The test is given at various periods during the day, and the measure of fatigue is obtained from the number of omissions filled in, the number overlooked, and the number of sentences that make sense.

The word 'fatigue' is also used, in various meanings, in the psychology of sensation. Thus, in the Young-Helmholtz theory of vision (see VISUAL SENSATION) it denotes a decreased susceptibility of the retina toward light. When a red surface becomes grayish during continued fixation, the red fibre of the retina is said to be fatigued for red light, and therefore to functionate less actively than at the beginning of stimulation. For this concept of fatigue, the rival theory of Hering substitutes that of adaptation. (See AFTER-IMAGE.) Fatigue is also applied, less definitely, to nervous processes in the organ of hearing. A tone, e.g. heard continuously for a long time becomes slightly less intensive. Both here, and in sensations of temperature, smell, and taste, where the effect of sustained stimulation is much more noticeable, it is well to substitute the word exhaustion for fatigue. Even in vision, the mental processes accompanying decreased excitability are entirely different from the fatigue-experience which we have discussed above. Consult: Mosso, *La fatigue intellectuelle et physique* (Milan, 1894); *American Textbook of Physiology*, ed. by Howell (Philadelphia, 1898); Titchener, *Experimental Psychology* (New York, 1901). For the method of exhaustion in olfactometry, see SMELL.

FATIGUE. In military phraseology, the term applied to such duties of the soldier as have nothing to do with the carrying of arms. The policing of camps or quarters, for instance, is a *fatigue* duty.

FATIGUE OF MATERIALS. See STRENGTH OF MATERIALS.

FATIGUE UNIFORM. See UNIFORM, MILITARY.

FATIMA, fä′tē-mȧ. (1) The name of Mohammed's favorite daughter. (2) A character in the story of Aladdin in the *Arabian Nights*. (3) Bluebeard's last wife, the only one not murdered by him.

FAT′IMITES, or **FAT′IMIDES** (from *Fatima*, daughter of Mohammed). The name of an Arabian dynasty representing the Shiite sect, which reigned for nearly two centuries over Egypt. Its founder was Obeid Allah, who assumed the title of *El Mahdi*, or Messiah, and claimed to be the descendant of Ali and Fatima, the daughter of Mohammed. He established his dynasty at Kairwan, in Northern Africa, in A.D. 909. His successors were El Kasim (c.935), El Mansur (c.945), and El Muizz, or Muizz-ed-dîn (c.952). Muizz conquered Egypt in 969, and founded Cairo as the Fatimite capital. He was followed by El Aziz (975), El Hakem (Biemr Allah) (996), El Dhahir (c.1020), El Mostansir (c.1035), El Mostali (1094), El Amir (1101), El Hafid (1130), El Dhafir (1149), El Faiz (c.1154), El Adhid (1160-71). In the year 1171, on the death of Adhid, Saladin (Salâh-ed-dîn), founder of the Ayubid dynasty, took possession of Egypt. Like all the Mohammedan dynasties, the Fatimites degenerated after attaining great power. They protected the Shiites, and the Caliph Hakem persecuted the orthodox Mohammedans, or Sunnites, as well as Jews and Christians. He was a relentless tyrant, but claimed to be the tenth and most perfect of the divine incarnations, and attempted, through an academy which he founded at Cairo, to establish a religious cult. (See DRUSES.) Consult Wüstenfeld, *Geschichte der Fatimiden-Chalifen* (Göttingen, 1881). See CALIPH.

FATS (AS. *fæt*, Icel. *feitr*, Dutch *vet*, OHG. *feizit*, Ger. *feist*, *Fett*, fat). An important class of substances found in all parts of the animal organism, although they occur mainly in subcutaneous tissue and on the surface of muscles. They are largely taken in ready-formed in the food. Unlike the albuminoids, however, they are also to some extent produced by the animal organism itself. As to their mode of formation, it was for a long time believed that they are derived in the body from sugar, starch, and other carbohydrates; in recent years, however, it has been shown that they are produced by the chemical transformation of albuminoids, though the presence of carbohydrates does seem necessary to their formation. The quantity of fat in the human body varies considerably at different periods of life. In the earlier stages of fœtal existence we find scarcely any fat; in new-born children there is usually a considerable quantity of this substance deposited under the skin, and the organism continues rich in fat till the age of puberty, when a marked diminution of the substance occurs. It again increases about middle life, and then occasionally occurs in great excess; for example, three or four inches of fat are not infrequently found under the skin of the abdomen of corpulent persons. Extraordinary deposits of fat in some particular part of the body are sometimes found both in men and in animals: the remarkable prominence of the buttock in Hottentot women is due to this cause. The uses of fat in the animal organism are manifold. It plays an important part in the process of cell-formation; it protects the body from external shocks by a uniform diffusion of pressure through the whole adipose tissue; it checks the loss of heat by radiation; it promotes the mobility of various organs, etc. Its chief use, however, consists in supplying a great part of the heat energy indispensable to animal life, heat being produced in the organism mainly by the combustion of available fat. A moderate accumulation of fat serves as a store of combustible matter in time of need. A superfluous growth of fatty tissue, on the other hand, is a source of great inconvenience, and gives rise to the condition known as obesity. See also FATTY DEGENERATION.

The fats are lighter than water; when brought in contact with paper or fabrics they leave a translucent *grease-spot*, which is generally very difficult to remove, though it can sometimes be washed out with ether, benzine, chloroform, oil of turpentine, and other organic liquids in which the fats are soluble. To determine the amount of fat in milk, cheese, or any other mixture submitted for examination, the analytical chemist dissolves out the fat with ether, separates the ethereal solution from the other ingredients, evaporates it, dries the residue, and weighs the pure fat thus obtained in a suitable dish. Fats have the peculiar property of forming *emulsions* with water, in which the minute globules of fat often remain in suspension for a very long time; milk is such an emulsion. To emulsify fat artificially, it is melted, if hard, and simply shaken up with water in which some carbonate of soda has been dissolved.

Besides serving as a necessary ingredient of food, fats are applied industrially to many useful purposes. They are often used as fuel and as illuminants, and very extensively for the manufacture of soap and candles. Formerly they were much used also as lubricants; in this application, however, they have been largely replaced by oil derived from Russian petroleum.

To obtain the fat, the suet from the animal body is pressed between warm plates or kneaded in muslin bags placed in hot water; the fat melts and is readily separated from the animal membranes. Or else the fat is dissolved out with ether, in which the membranes are insoluble. Another process sometimes employed consists, on the contrary, in dissolving the membranes with dilute acid or alkali, which leaves the fat unattacked. The crude fat may be purified by treatment with sulphuric acid.

Fats are composed of carbon, hydrogen, and oxygen. Their chemical nature was thoroughly explained by the French chemist Chevreul as far back as 1811. Chevreul showed that fats are combinations of ordinary glycerin and certain so-called *fatty* acids. Glycerin is a tri-atomic alcohol; that is to say, like the hydroxide of a tri-valent metal (such as ferric hydroxide), it acts like a weak base and is capable of combining with three molecule equivalents of a monobasic acid (such as ordinary acetic acid). The combination of an alcohol and an acid is called in chemistry an *ester*, or ethereal salt. The esters of glycerin and stearic, palmitic, and oleïc acids are called, respectively, *tri-stearin*, *tri-palmitin*, and *tri-oleïn*. The various fats are mixtures mainly of these esters or 'glycerides,' containing them in varying relative quantities. Fats, like tallow, containing a large proportion of tri-stearin and tri-palmitin are comparatively hard; on the contrary, lard and similar fats, which are soft and pasty, are found to contain a high percentage of tri-oleïn. The color, state, consistency, etc., of fats vary with the source from which they are derived. The fat of carnivorous animals has a peculiar disagreeable odor, and is not so hard as that of herbivora. *Human fat* contains, besides tri-palmitin, tri-oleïn, and some tri-stearin, also a yellow substance resembling bile by its odor and bitter taste. The animal secretions all contain a certain amount of fat; ear-wax, for instance, has been shown to contain some tri-stearin and some tri-oleïn. *Butter* contains about 87 per cent. of fat, including a considerable amount of tri-butyrin (the ester of glycerin and butyric acid); *oleomargarine*, prepared from the best beef tallow, differs but slightly in composition from butter.

When exposed to the action of steam heated to a temperature of 400° F. (about 200° C.), all fats and fatty oils are decomposed into their chemical constituents. The same action takes place in the presence of moisture, though much more slowly, at ordinary temperatures (the rancidity of fat is due to the separation of free acids, and may, therefore, be removed by dissolving out the acids with water). A similar decomposition takes place in the animal organism; steapsin, one of the pancreatic ferments, splits up and emulsifies fat in the process of digestion. Even more readily than with hot steam, and at a much lower temperature, is the decomposition of fat effected with caustic alkalies. When fats are treated with sodium or potassium hydroxide, the metal takes up the acid of the fat, forming the salts known in common life as *soap*, while the glycerin of the fat is set free. The process is extensively employed in the manufacture of soap, and is therefore generally spoken of by chemists as the *saponification* of fats. See ESTERS.

In the animal organism, or when heated with free access of oxygen, fats are burned (oxidized) completely, yielding, like other compounds of carbon, water and carbonic acid. But when they are burned incompletely, as sometimes in careless cooking, a number of combustible gases are produced, including the vapors of acroleïn, to which the irritating odor of superheated fat is due. See OILS.

FATSHAN. A great trading mart and manufacturing centre in the Province of Kwang-tung, South China, second in importance to Canton (q.v.). It is one of the five *chin* or great marts of the country, the others being King-teh-chin, in Kiang-si; Siang-t'an, in Hu-nan; Hankow, in Hupeh; and Singan-fu, in Shen-si. It is situated on the left bank of the Chu-kiang, or Pearl River, near the mouth of the North River, and 15 miles by water west by north of Canton. It has a population of 500,000. Its industries include the manufacture of cloth, silk, paper, embroideries, porcelain, rattan, bamboo, and brass wares; but it is especially noted for its iron and steel manufactures, and has been called 'the Birmingham of China.' Whole cargoes of old horseshoes and old iron of all kinds are annually shipped to it from Great Britain for use in this industry. Fatshan also does a large business in cassia, grain, oil, and timber. The town is facilitating the immense traffic with Canton. It has a telegraph station, two churches, and the Wesleyan Hospital, with accommodation for 1000 patients. It is said that before the expulsion of the Jesuit and other missionaries the Christians of Fatshan numbered 10,000, but no trace of them is now to be found.

FATTORI, fät'tô-rê, GIOVANNI (1825—). An Italian painter, born in Livorno. He was a pupil of Giuseppe Bezzuoli in Florence, studied further in the academy there, and in 1859 exhibited his first important work, "The Battle Near Magenta" (Florence Academy). In 1877 he became a professor in the Academy of Florence and a member of that of Bologna. Other paintings of his are: "The Battle Near Madonna della Scoperta"

(1868; Livorno Gallery); "The Wounding of Prince Amadeo near Custozza" (1870; the Brera, Milan). Some few genre pictures also are from his brush, including "The Horse Market in the Piazza Montanara, Rome," and "The Horse Market in Terracina." In his battle subjects he displays much dramatic skill.

FATTY DEGENERATION. A pathological term signifying the gradual replacement by fat-globules of the tissues of a living body, impairing and finally destroying them. These globules, though originating in the living tissues and existing among them, have in themselves no element of life; hence, when they replace living tissues, they are destructive of them. Fatty degeneration must be distinguished from obesity, which is simply excessive deposition of fat between the tissues. The disease, which is not curable, is of frequent occurrence, and it attacks nearly all the tissues, particularly the muscular and cellular, as in the heart and liver, which organs are often the seats of the disease. The red blood-globules and the nerves are probably never attacked by it.

FATUITY (Lat. *fatuitas*, foolishness, from *fatuus*, foolish). The impairment or extinction of intelligence, of memory, and of the will, rendering the patient apathetic, passive, plastic. The disease may involve the affections and the moral sense, and abrogate the power of decision and all spontaneity of action and thought. The term was formerly used as a synonym of dementia, but is now applied to idiocy (q.v.), and rarely to a condition existing during continued fevers or other exhausting diseases, in which the patient is dull, apathetic, and intellectually feeble.

FAUBOURG, fŏ̇′bo͞or′ (OF. *forbourg*, from *fors*, Fr. *hors*, from Lat. *foris*, outside, beyond + *bourg*, from Lat. *burgus*, OHG. *burg*, Ger. *Burg*, AS. *burh*, Eng. *borough;* formerly written also *faux-bourg*, false town, by popular etymology). A suburb in French cities, a part of the town now indeed within the walls (or the town limits), but which was without them when, in former days, the walls were less extensive.

FAUCES, fa̤′sēz (Lat., throat). The back part of the mouth, consisting of the passage from the cheek-cavity proper to the cavity of the pharynx. Above the fauces is the soft palate, and on either side are the pillars of the fauces, between the folds of which lie the tonsils (q.v.). See TONGUE; PALATE; PHARYNX.

FAUCHE, fōsh, HIPPOLYTE (1797-1869). A French Orientalist, born at Auxerre. After writing a theological poem, *Panthéon* (1842), and a novel, *La Sœur Gabrielle* (1844), he devoted his life and fortune to the task of translating into French various Sanskrit works. Among these are: *Gîta Govinda* and *Ritou Sanhara* (1850); *Bhartrihari* and *Tchaura* (1852); a part of the *Rāmāyana* (1854-58, in 9 vols.; abridgments, in 2 vols., 1869; and in one, 1892); *Œuvres complètes de Kalidasa* (1859-60); *Une Tétrade*, containing the *Mrichakatika* of Śudraka, the *Daçakumaracharita*, the *Mahimnastava*, and Magha's epic *Sisupala Badha* (1861-63); and about a third of the *Mahābhārata*, in ten volumes (1863-72). These translations contain many errors, as was inevitable considering the difficulties under which he labored, but they are marked by much sympathy for the original and by frequent felicity of rendition.

FAUCHE-BOREL, bŏ̇′rĕl′, LOUIS (1768-1829). The principal agent of the Bourbons during the royalist intrigues and conspiracies of the Revolutionary, Consular, and Imperial periods. He was born at Neuchâtel, and received a very thorough education. He was a printer at the outbreak of the Revolution, conducted the negotiations with Pichegru for the restoration of the Bourbons, and for that purpose became established as a publisher at Strassburg. Here he was captured by order of the Directory in 1795, but was subsequently released. After the flight of Pichegru to England, Fauche-Borel continued the negotiations with Barras. In consequence of this he was banished from France. Nevertheless he undertook to circulate the manifesto of Louis XVIII. even after the accession of Napoleon to the throne. After a sojourn of eight years in England and Sweden, he returned to France in 1814 with the allied armies, and was employed to conduct certain secret negotiations. He subsequently became Prussian Consul-General at Neuchâtel. His services were unrecognized by the Bourbons until the accession of Charles X., when he received a pension of 5000 francs. His interesting *Mémoires* were published after his death by Beauchamp (4 vols., 1828-29). The British Museum contains an English work by Fauche-Borel entitled *Exposition of the Persecution Which Louis Fauche-Borel Has Experienced . . . in Consequence of the Zeal He Has Manifested in the Service of England and in the Cause of Legitimacy.*

FAUCHER, fŏ̇′shă̇′, JULIUS (1820-78). A German economist, co-founder of the German free-trade party. He was born in Berlin, and studied philosophy and political economy in that city. He early revealed himself a disciple of Adam Smith, and a defender of the policy of Cobden and the English free-traders. Afterwards he became the founder of the *Abendpost* at Berlin, the first free-trade journal of Germany; and the organizer, with Wiss, Beta, Prince-Smith, and others, of the first German free-trade society, afterwards known as the Economic Society of Berlin. Upon the suppression of the *Abendpost* Faucher went to England, where in 1856 he became one of the editors of the *Morning Star*, the first free-trade paper established in London. Upon his return to Germany in 1861, he began a vigorous agitation in favor of liberty of domicile, industrial freedom, and free international commerce. He was elected member of the Prussian Diet in the same year. In 1863 he founded at Berlin the *Vierteljahrsschrift für Volkswirtschaft, Politik und Kulturgeschichte*, and in the campaign of 1870-71 accompanied the German Army as correspondent of the London *Daily News.* Besides his contributions to economics, which appeared in the *Vierteljahrsschrift*, he published the books of travel entitled: *Ein Winter in Italien, Griechenland und Konstantinopel* (1876); *Vergleichende Kulturbilder aus den vier europäischen Millionenstädten* (1877); *Streifzüge durch die Küsten und Inseln des Archipels und des Ionischen Meeres* (1878); and the English essay, "Russian Agrarian Legislation in 1861," in *System of Land Tenure in Various Countries* (3d ed. 1881).

FAUCHER, LÉON (1803-54). A French publicist and political economist. He was born at Limoges, and was educated at Toulon and Paris. He became editor-in-chief of the *Temps*, *Courrier de Paris*, and *Constitutionnel;* was one of the principal advocates of free trade, and a frequent writer on economics in the *Siècle* and the *Revue des Deux Mondes*. After the Revolution of 1848 he was elected to the Legislature, and upon the election of Louis Napoleon to the Presidency was appointed Minister of Public Works (December 20, 1848), and soon afterwards Minister of the Interior, as successor to Léon de Maleville. He retired from public life in 1851. A collection of his valuable economic works is included in the *Mélanges d'économie et de finance*, published by the economist Wolowski, Faucher's brother-in-law (1856).

FAUCHER DE SAINT-MAURICE, fō′shā′ de săɴ′ mō′rēs′, NARCISSE HENRI EDOUARD (1844-97). A French-Canadian journalist and author. He was born at Beaumont, Bellechasse, in the Province of Quebec; was educated at the seminary there and at the College of Sainte Anne de la Pocatière, and in 1864 went to Mexico, where he became captain in the army of Maximilian and afterwards aide-de-camp to Gen. Viscount d'Hurbal. For valor and integrity he was created a knight of the Imperial Order of Guadeloupe by Maximilian, and was given the medal of the Mexican campaign by Napoleon III. Returning to Quebec in 1866, he was appointed clerk of the Legislative Council of the Province of Quebec—a post which he held for fourteen years. As editor of *Le Journal de Québec* (1883), and subsequently of *Le Canadien*, he had a brilliant career in journalism. For his services to France in the Canadian press, he was created a Chevalier of the Legion of Honor (1881). In general literature, Faucher is best known for his sympathetic descriptions of historical places along the Saint Lawrence. Among his separate publications are: *A la Brunante, contes et récits* (1874); *De Québec à Mexico* (1874); *Choses et autres* (1874); *De Tribord à Babord* (1877); *Promenades dans le golfe Saint-Laurent* (1879); and *En route* (1888).

FAUCIT, fa̤′sĭt, HELEN (1820-98). An English actress, born in London. She was the daughter of an actor, John Saville Faucit, and made her début at Covent Garden, London, January 5, 1836, as Julia in *The Hunchback*, winning at once a great reputation. She became the leading lady in Macready's Shakespearean revivals, and was also the original impersonator of the heroines in Bulwer's, Browning's, and other modern plays. After her marriage in 1851 to Theodore Martin, afterwards Sir Theodore, she continued occasionally to appear on the stage, though later than 1864 she rarely did so except for a charitable object. One of her last appearances was as Beatrice at the opening of the Shakespeare Memorial Theatre at Stratford in April, 1879. She was the friend of many noted people and a reader to Queen Victoria. In 1887 she published *On Some of the Female Characters of Shakespeare*. Her death occurred near Llangollen, Wales. Consult *Actors and Actresses of Great Britain and the United States*, edited by Matthews and Hutton (New York, 1886).

FAUJAS DE SAINT-FOND, fō′zhā′ de săɴ′-fôɴ′, BARTHÉLEMY (1741-1819). A French geologist and paleontologist, born at Montélimart. As an expert geologist he was sent as commissioner of the King on extensive travels for the purpose of making an especial study of the products and phenomena connected with volcanoes. He was professor of geology at the Museum of Natural History, Paris, from 1793 to 1818. His works include: *Recherches sur la pouzzolane* (1778); *Recherches sur les volcans éteints du Vivarais et du Velay* (1778), in which he formulates a new volcanic theory; *Minéralogie des volcans* (1784); *Voyage en Angleterre, en Ecosse et aux Hebrides* (1797; Eng. trans. by the author, 1799).

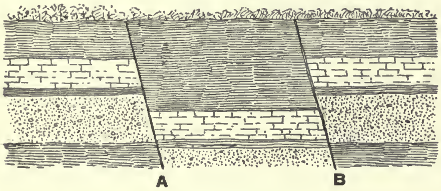
FAULKNER, fa̤k′nẽr, CHARLES JAMES (1806-84). An American lawyer and politician. He was born in Martinsburg, Va. (now West Virginia); was educated at Georgetown University, and was admitted to the bar in 1829. In 1832 he was elected to the Lower House of the Virginia Legislature. In 1848 he introduced in the Virginia House of Delegates a law after which the Fugitive Slave Law of 1850 was modeled. From 1851 to 1859 he was a member of Congress from Virginia. In 1859 he was appointed by President Buchanan Minister to France, where his action in influencing Louis Napoleon to favor the Confederacy led to his recall by President Lincoln in 1861. Upon his return to the United States he was arrested and confined in Fort Warren, Boston Harbor. When released he went south and served in the Confederate Army on the staff of 'Stonewall' Jackson. After his political disabilities were removed, in 1872, he was a member of the State Constitutional Convention in West Virginia in that year, and was again a member of Congress from 1874 to 1877.

FAULKNER, JOHN ALFRED (1857—). A Methodist Church historian. He was born at Grand Pré, Nova Scotia, July 14, 1857, graduated at Drew Theological Seminary, Madison, N. J., 1881, and after service in the pastorate, became professor of church history there in 1897. He has written many papers upon Church history for the reviews, and was a contributor to Hurst's *History of the Christian Church* (New York, 1897-1900).

FAULKNER'S ISLAND. An island in Long Island Sound, about five miles southeast of Guilford, Conn. (Map: Connecticut, E 5). It has a lighthouse and a fog-bell.

FAULMANN, foul′män, KARL (1835-94). An Austrian stenographer and author, born at Halle, Germany. He taught the Gabelsberger system from 1860, was appointed professor in 1884, edited several stenographic journals, and invented a system of phonography (published by Brant in 1875). Based upon a radical reform of the Gabelsberger system, it is easy of comprehension, but less pliable and characteristic than the system it aims to supplant. It has been adapted to the French, Czech, and Servian languages. The principal works of Faulmann are the following: *Lehrgebäude* (35th ed. 1899); *Anleitung zur phonetischen Stenographie* (6th ed. 1896); *Die Phonographie in ihrem Verhältnis zur Kurrentschrift und Stenographie* (1878); *Das Buch der Schrift* (2d ed. 1880).

FAULT (OF., Fr. *faute*, Sp., Port., It. *falta*, flaw, from Lat. *fallere*, to deceive. Gk. σφάλλειν, *sphallein*, to slip, Skt. *phal*, to deceive, Lith. *pùlti*, OHG. *fallan*, Ger. *fallen*, Icel. *valla*, AS. *feallan*, Eng. *fall*), or Dislocation. In geology, a displacement of rocks along a plane of fracture. The plane of fracture may be inclined at any angle to the horizon, and the displacement may be vertical or horizontal, but usually both. The angle made by the fault plane with a vertical plane is called the 'hade' or 'slope' of the fault. The inclination of the fault plane with the horizontal plane is called the 'fault dip.' Where the displacement is partly vertical, the side on which the rocks lie at a higher level than that of their continuations across the fracture is called the 'upthrown side,' and the other is called the 'downthrown side.' Also the side toward which the fault plane dips is called the 'hanging wall,' while the other side is called the 'foot-wall.' The 'throw' of a fault is its vertical displacement. The horizontal displacement is sometimes called the 'heave.' Where the hanging-wall side of a fault is depressed with reference to the foot-wall side, the fault is said to be a *normal* or *gravity* fault. Where the hanging-wall side is thrust up over the foot-wall side, the fault is said to be a *reversed* or *thrust* fault. In a gravity fault the dip of the fault plane is usually great; in a thrust fault, small. This displacement in normal faults is due to gravity, and causes the affected bodies to occupy greater horizontal area. The displacement of a thrust or reversed fault originates in compression of the rock mass.



SECTION SHOWING FAULTS.

a, Normal Fault; *b*, Reversed Fault.

In general, faults are one of the manifestations of the deformation which rocks undergo in the outer parts of the earth's crust where they yield by fracture. (See Crust of the Earth.) Faults are accompanied by various phenomena such as brecciation, jointing (see Joints), and slickensiding, which are the common accompaniments of relief from pressure. While faults with marked throws are not very frequent, it is difficult to find a fracture in the earth's crust where some slight displacement of the parts has not occurred, for fractures develop in the relief of rocks from pressure, and relief cannot be obtained without at least a slight differential movement. In mountain masses the displacement by faulting may amount to hundreds, or even thousands, of feet. See Mountain; Geology.

FAUNA. The indigenous animals of a designated place, region, or space of time, considered collectively—the correlative of 'flora' (q.v.). The space in view may be a geographical surface, as a country, or a certain neighborhood; or it may be a certain environment. Moreover, the word is frequently compounded, as 'avifauna,' 'piscifauna,' etc., in order to designate that only the birds, fishes, or other single group of the given region are under consideration. Conversely, a district characterized by a fauna of any particular nature is spoken of as a 'faunal region.' For further elucidation of these definitions, see Distribution of Animals.

In geology and paleontology, the term is employed in a sense somewhat different from that in which it is used by the zoölogist. The paleontologist conceives of a 'fauna' as an assemblage of animals inhabiting a particular region during a geologic hemera, epoch, or period. The fossil remains of such a fauna would be found scattered through the successive layers of all the deposits formed during the period of its existence. Such a fossil fauna undergoes changes in its make-up; some species drop out, other new ones come in from adjoining provinces, and the species themselves often exhibit evolutional changes. The broader the use of the term, the more apparent the modifications of the fauna. Thus the 'Ordovician fauna' of New York State is a comprehensive use of the term, and involves a large, heterogeneous assemblage of fossil organisms; but the 'Upper Chazy' fauna of the Champlain Valley is a more restricted use and refers to a concrete, homogeneous member of the larger group. For further discussion, see Paleontology.

FAUNCE, William Herbert Perry (1859—). An American clergyman and educator, born at Worcester, Mass. He graduated in 1880 at Brown University, and in 1884 at Newton Theological Seminary, and from 1884 to 1889 was pastor of the State Street Baptist Church of Springfield, Mass. From 1889 to 1899 he was pastor of the Fifth Avenue Baptist Church of New York City, in 1896-97 was a lecturer in the Divinity School of the University of Chicago, and in 1898-99 was a member of the board of resident preachers of Harvard University. In 1899 he became president of Brown University. His writings include numerous contributions, chiefly to religious periodicals.

FAUN OF PRAXIT′ELES, The. A celebrated statue, of which the best extant copy is in the Capitoline Museum at Rome. This figure suggested the title of Hawthorne's *Marble Faun*, in which a fine description of the statue is given.

FAUNUS. Faunus is an early Italian god of the country, and especially the life on the farm; a god of fruitfulness in fields and flocks, a kindly divinity, as his name shows (*faunus*, from *favere*). He dwelt in the hills and woods, and was worshiped there. He was also gifted with prophecy, and to him were attributed the strange voices and sounds heard in the woods. His companion divinity was Fauna. This old Roman god was identified by Roman poets with the Greek Pan, and under the influence of Greek models assumed the form and attributes of that deity. From this also developed the conception of fauni, or fauns, creatures like the Greek satyrs, with pointed ears, goats' hoofs and tails. In art the later Greek conception minimized the goat-nature. Under the euhemeristic tendencies of the time, Faunus entered the list of the early Latin kings as the father of Latinus, son of Picus, and representative of the early civilization. In some of the villages a festival in honor of Faunus seems to have been held on December 5th, but in Rome the great festival of the *Lupercalia*, on February 15th, was celebrated in his honor.

FAUQUE DE JONQUIÈRES, fôk de zhôn′-kyâr′, Jean Philippe Ernest de (1820—). A

French mathematician and naval officer, born at Carpentras. As chief of staff to Admiral La Grandière in Cochin-China, he organized at Saigon the first agricultural and industrial exposition in the French Asiatic possessions. He was appointed vice-admiral October 1, 1879, and in 1883 became director of the Bureau of Charts and Plans. His mathematical works include: *Mélanges de géométrie pure* (1856); *Essai sur la génération des courbes géométriques* (1859); *Théorèmes fondamentaux sur les séries de courbes et de surfaces algébraiques*, etc. (1865). He also translated into French the *Epistles* and the *Art of Poetry* of Horace.

FAUQUIER, fą'kwẽr, Francis (c.1704-68). A Colonial Governor of Virginia. He succeeded Dinwiddie as Lieutenant-Governor of Virginia in 1758, and retained this position until his death. In 1765, upon the passage of Patrick Henry's famous Stamp Act resolutions, he dissolved the Virginia House of Burgesses. He also opposed the assembling of the Stamp Act Congress, and by refusing to summon the newly elected House of Burgesses, prevented the Colony of Virginia from choosing delegates in compliance with the invitation of Massachusetts. He published *An Essay on Ways and Means of Raising Money for the Support of the Present War, Without Increasing the Public Debts* (1756).

FAURE, fôr, François Félix (1841-99). A French statesman, President of the French Republic from 1895 to 1899. He was born in Paris, learned the trade of a tanner, and removed early in life to Havre, where he entered the employ of a large leather firm, of which he became the controlling partner. He was president of the Chamber of Commerce at Havre on the breaking out of the Franco-Prussian War, through which he served as a captain in the Garde Mobile. He did not enter political life until 1881, in which year he was elected to the Chamber of Deputies from Havre as a moderate Republican. In the same year he was appointed Under-Secretary of State for Commerce and the Colonies in the Gambetta Cabinet—a position he held until the fall of the Ministry in January, 1882. He was appointed to the same position in the Cabinet of M. Ferry in 1883, and retained it until the resignation of the Cabinet in March, 1885. In the following October he was returned to the Chamber of Deputies, where he became the chief spokesman of the group known as Union Republicans. In the short-lived Cabinet of M. Tirard (January to February, 1888), he held for the third time the Under-Secretaryship for Commerce and the Colonies. He continued to serve in the Chamber of Deputies, being repeatedly elected its vice-president. Upon the election of M. Casimir-Périer to the Presidency in 1894, M. Faure was appointed Minister of Marine in the Cabinet of M. Dupuy. He was occupying this position when Casimir-Périer suddenly resigned the Presidency in January, 1895, and Faure was elected to fill the vacancy.

M. Faure was not a great statesman, and his career as President was not a brilliant one. But he was conservative and safe, and in the first years of his administration, at least, popular with the working people, who recognized in him one of their own class. The four years (1895-98) were years of more than usual quiet in France, both in internal and foreign affairs. The Franco-Russian alliance was the only step of any importance in the Republic's foreign relations, and the unfortunate Fashoda affair was happily terminated. In 1898 the agitation for a re-trial of Dreyfus caused considerable feeling, the outcome of which President Faure, however, never knew. He was stricken with apoplexy, and died on February 16, 1899.

FAURE, Jean Baptiste (1830—). A French barytone and composer, born at Moulins. When thirteen years old he entered the Paris Conservatory, and became a chorister at the Madeleine, where his instructor was Trévaux. After having won first prize in the comic opera class at the Conservatory, he made his professional début at the Opéra Comique in 1852. His first triumph came in 1857, and two years later Meyerbeer wrote for him the role of Hoël in the *Pardon de Ploërmel.* In 1861 he appeared at the Grand Opéra, and his subsequent career was a repetition of successes. In 1857 he had become a professor at the Conservatory. For a time he sang in London and in Germany, but in 1876 left the opera, and thereafter appeared only in concerts. In 1881 he was made a chevalier of the Legion of Honor. As a composer Faure was well known for his sacred songs, many of which largely owed their popularity to his interpretation. Among them are *Les Rameaux* (The Palms), *Pie Jesu*, and *Crucifix.* In 1886 he published *La Voix et le Chant*, a treatise, with numerous exercises, on vocalization. Besides being a musician, Faure was also an art connoisseur and collector.

FAURIEL, fō'ryĕl', Claude Charles (1772-1844). A French philologist, historian, and critic, born at Saint Etienne. From 1830 until his death he was professor of foreign literature in the Faculty of Letters at Paris. In 1836 he published his chief work, *Histoire de la Gaule méridionale sous la domination des conquérants germains*, which constituted a section of an extensive projected history of culture and literature in France. Worthy of notice, also, particularly on account of its historical introduction, is his edition of the Provençal rhymed chronicle, entitled *Histoire de la croisade contre les hérétiques albigeois* (Paris, 1837). After his death there appeared two collections of his lectures, *Histoire de la poésie provençale* (1846) and *Dante et les origines de la langue et de la littérature italiennes* (1854). His works served to stimulate the study of the literature of the Middle Ages, though his learning is frequently more extensive than exact.

FAUSBÖLL, fous'bẽl, Michael Viggo (1821—). A Danish philologist and Pāli scholar, born at Hove, near Lemwig. In 1861 he received an appointment in the library at Copenhagen, and in 1878 he was made professor of Indo-Oriental languages in the university. His chief work has been in the editing of Pāli texts, and in thus spreading a knowledge of the Buddhist sacred books. Among his important publications are: *The Dhammapada*, with a translation and commentary in Latin (Copenhagen, 1855; 2d ed. London, 1900); *Five Jātakas*, with English translation (1861); *Two Jātakas* (1870); *Dasaratha Jātaka* (1871); *Ten Jātakas* (1872); *The Jātakas*, with an English commentary to be in six volumes (London, 1876-96). He has also written much on other subjects.

FAUS'SET, Andrew Robert (1821—). A biblical scholar of the Church of England, born at Silverhill, Ireland. He graduated at Trinity College, Dublin, in 1843; became rector of Saint Cuthbert's, York, England, in 1859, and Canon of York in 1885. With Robert Jamieson and David Brown he prepared a commentary on the whole Bible entitled *The Library Commentary* (London, 1868); separately he issued the well-known *Horæ Psalmicæ* (1877, 3d ed. 1885); *The Englishman's Critical and Expository Bible Cyclopædia* (1879, 3d ed. 1891).

FAUST, foust, Bernhard Christoph (1755-1842). A German physician. He was born at Rotenburg, Hesse, was educated at Göttingen and Rinteln, and in 1788 became physician in ordinary at Bückeburg. He was one of the first physicians in Germany to adopt vaccination, and published on that subject: *Ueber die Kuhpocken und deren Impfung* (1801); and *Oeffentliche Anstalten, die Blattern durch Einimpfen der Kuhpocken auszurotten* (1804). The most important of his numerous hygienic works is the *Gesundheitskatechismus zum Gebrauche in den Schulen und beim häuslichen Unterricht* (1794, and frequently republished). Of the three English translations of the work, the latest is entitled *A New Guide to Health, Compiled from the Catechism of Dr. Faust* (1832).

FAUST, or **FAUS'TUS,** Johann (c.1485-c.1540). A German charlatan, astrologer, and soothsayer, supposed to have performed marvels by the aid of the Devil, and to have been carried away by him at his death. Such tales made their first appearance in literature as *Historia von Dr. Johann Fausten* at the book-fair at Frankfort-on-the-Main in 1587. This relates how the son of a peasant achieves distinction at the University of Wittenberg, but seeks to deepen his knowledge by magic arts, secures a devil, Mephistopheles, for his servant for 24 years, after which Faust is to belong to the Devil. This compact is sealed in Faust's blood. The Devil amuses Faust and his professorial famulus Wagner with high living, sexual indulgence, and visions of the spirit world. This rouses remorse, and Faust seeks consolation in mathematics, afterwards visiting hell and the stars, making wide travels, playing magic pranks, sharing in student revelry, conjuring the Grecian Helen from the nether world, living with her as concubine, and begetting a soothsaying child. When the 24 years are over the Devil carries away Faust, who ruefully points the moral of his folly.

This tale was rendered into metrical English in that very year, and was turned into German rhymes in 1588. There was a new edition, too, with some changes, and in 1589 a French version by Victor Palma Cayet. The German version was done into English prose, and of this there was a revision in 1592, with a Dutch version of the same year, in which the death of Faust is dated October 23-24, 1538. Soon after the story first reached England its central thought was seized on by Marlowe in his powerful drama *The Tragedy of Dr. Faustus*, written as it seems in 1588, though not entered at Stationers' Hall till 1601. Here the poet modifies the zealous and mortally serious Lutheran of the *Historia*, who had made Faust the counterpart of Luther, as he was in fact his contemporary. Faust brings to the University of Wittenberg 'a foolish and arrogant mind,' seeking to explore nature beyond scholarly tradition, and so led to classical culture, and to the Devil. The Luther of history and the Faust of the legend both lectured on ancient culture. Faust yields to it and Helena. Luther marries after the Christian ordinance. Luther clings to his Bible. Faust would explore behind and beyond it. Luther fights with the Devil; in the legend, Faust compacts with him. Both visit Rome. Luther is roused to revolt, Faust is amused and cynical.' Read in this light, the *Historia* shows orthodoxy, brandishing its theological birch at the freedom of human inquiry. But with Marlowe Faust is a type of intellectual pride, a modern Lucifer, jealous of his God.

It was the melodramatic and spectacular elements in his drama, however, that made it hold the stage, and after Marlowe's death (1593) these were still further accentuated, so that when English actors brought the drama back to Germany it was essentially a popular, not to say a vulgar spectacle, in which a clown, who in Goethe's drama has become Wagner, representing the shrewd philistine commonsense of the middle class, is accorded the chief part. A still further fall awaited the legend—it became a puppet play, a Punch and Judy show to amuse children; and thus it was seen by the boy Goethe, as a modification of it may yet be seen by the German children of to-day. The situation, however, involved the deepest problems of man's mortal existence. Its possibilities were being widely perceived. Friedrich Müller, the painter-poet, published in 1778 two fragments of a dramatized *Faust's Leben.* Lessing also twice essayed the subject. Klinger, of the Storm and Stress (q.v.), published (1791) a romance on *Faust's Leben, Thaten und Höllenfahrt* (translated by Borrow, 1826). Goethe, who had begun work on the subject in 1773, and committed several scenes to friends in 1775 in the so-called Göchhausen MS., published *Faust, ein Fragment*, in 1790, the complete first part in 1808. The second part appeared posthumously. Klingemann wrote a tragedy (1815), Lenau an epic (1836), Heine a ballet (1851) on *Faust.* Goethe's *Faust* was adapted to the English stage by W. G. Wills in 1885, and produced with much splendor and success by Sir Henry Irving. Of Goethe's *Faust* there are many English translations, of which Bayard Taylor's is perhaps the most useful. The most convenient *Bibliography* of the older Faust literature is Engel's *Zusammenstellung der Faust-Schriften* (Aldenburg, 1885).

FAUST, or **FUST,** Johann. See Fust.

FAUS'TA, Flavia Maximiana (289-327). A Roman empress, a daughter of Maximianus, a colleague in the Empire with Diocletian, and compelled to abdicate with him. Fausta became the second wife of Constantine the Great in A.D. 307. She was ambitious, and was constantly intermeddling in affairs of State. She had great influence with Constantine, for whose advancement she was willing to make almost any sacrifice. It is said that she reported to him a plot in which her father, Maximianus, was concerned, thereby causing Constantine to order the execution of Maximianus. She met her death by suffocation in a heated bath, at Constantine's order. This action is variously stated as being due to a discovery of her infidelity, or at anger upon finding the falsity of statements made by her which had led him to put to death Crispus, his son by a former wife. She was the mother of the subsequent emperors, Constantinus II., Constantius II., and Constans.

FAUSTIN I., fō′stăɴ′ (1785-1867). An emperor of Haiti, known before his elevation to the throne as Faustin Soulouque. He was a negro, and was born in very humble circumstances at Petit Goave in Haiti. In his youth he acted as a servant, and later as adjutant to General Lamarre, and took part in the negro insurrection of 1803. He subsequently served under the Presidents Pétion and Boyer, and was raised by the latter to the rank of captain. After the year 1844, when the Haitian Republic was dissolved by the rebellion of the eastern part of the island, which established the Republic of Santo Domingo, a struggle for the supreme power ensued, in which Faustin, as Governor of Port-au-Prince and commander of the Presidential Guard, played an important part. In 1847 he was appointed President of the Republic by the Senate, which hoped to find a pliable tool in him; but he speedily began to follow his own inclinations. He was an implacable enemy of the mulattoes, and on April 16, 1848, a massacre of the mulatto population in Port-au-Prince took place at his instigation. In August, 1849, he caused himself to be proclaimed Emperor, a title which he held for about ten years. Between 1849 and 1857 he made four attempts to conquer Santo Domingo, but failed. His reign was marked by oppression and cruelty; he plundered the country to meet the expenditures of his Court, which he conducted in apish imitation of that of Napoleon III. A revolution, headed by General Geffrard, broke out in 1858, and a republic was declared. Faustin was forced to abdicate in January, 1859, but was allowed to live and sent off to Jamaica. He returned to Haiti shortly before his death, which occurred on August 6, 1867.

FAUSTI′NA. The name of two Roman empresses, mother and daughter. The former, Annia Galeria Faustina, usually spoken of as Senior, was the wife of the Roman Emperor Antoninus Pius, and died A.D. 141 (or perhaps, 140); the latter, known as Faustina Junior, was married to his successor, Marcus Aurelius Antoninus, and died at a village near Mount Taurus in A.D. 175. Both, but particularly the younger, were notorious for the profligacy of their lives, which their exemplary husbands in vain endeavored to check. After their deaths, institutions for the relief of poor girls were founded both by Antoninus and Marcus Aurelius in honor of them, and were called "*Puellæ alimentariæ Faustinianæ.*"

FAUSTMANN, foust′mȧn, Martin (1822-76). A German forester, born at Giessen. He invented an instrument for measuring the height of trees, and made valuable studies in the problems of forest valuation, a subject which is discussed in his work, *Berechnung des Wertes, welchen Waldboden sowie noch nicht haubare Holzbestände für die Waldwirtschaft besitzen*, published in the *Allgemeine Forst- und Jagdzeitung* (Frankfort, 1849).

FAUS′TULUS. The legendary shepherd who discovered the abandoned infants Romulus and Remus, and took them to his house, where they were brought up by his wife, Acca Larentia. His hut was shown on the Palatine.

FAUSTUS OF RIEZ, rē-ā′. A semi-Pelagian of southern France, who lived during the fifth century. The place of his birth is disputed, and the precise dates, of both his birth and death, are unknown. He entered the monastery at Lerinum (Lerins), where he was afterwards (about 433) made abbot. Here he was vigorous in defending the rights of the monastery against the Diocesan Bishop of Fréjus. After some twenty-five years of service as abbot, Faustus was made Bishop of Regium (Riez), in Provence, which office he held until his death. During about four years of this time (c.481-485) he suffered exile, probably on account of his strictly orthodox Trinitarian doctrine, which offended the (Arian) West-Gothic King, Eurich. Faustus opposed all Arianism and other Eastern heresies, e.g. Macedonianism and Nestorianism; but judged by Augustinian standards, he fell into error in his views respecting free will and divine grace. He belongs to that large class of fifth-century Churchmen who are called Semi-Pelagians, though perhaps Semi-Augustinians would be a more accurate designation. (See Semi-Pelagianism.) He held peculiar views regarding the soul, apparently teaching its corporeality.

Among Faustus's writings are letters, dogmatic and ethical treatises, and homilies. Two of his homilies on the Creed (wrongly attributed in the manuscripts of Eusebius of Emesa) are of special value. His interest in the ascetic life is illustrated by his six *Sermones ad Monachos.* His chief work, entitled *On the Grace of God,* exhibits the Semi-Pelagian side of his teaching. An incomplete edition of Faustus's works may be found in Migne, *Patrol. Lat.*, lviii.; a better edition is that by Engelbrecht, in *Corpus Scriptorum Eccles. Lat.*, xxi. (Vienna, 1891). Consult: Harnack, *History of Dogma*, vol. v., English translation (London, 1898); Fisher, *History of Christian Doctrine* (New York, 1896).

FAUVEAU, fȯ′vȯ′, Félicie de (1803-87). A French sculptor. She was born in Florence of an old Legitimist family in Brittany, and was compromised in the Royalist movement of 1832, but escaped to Brussels. Among her works are: "The Abbot" (from Scott's novel); "Judith Showing the Head of Holofernes to the People;" and a monument to Dante with a bas-relief representing the death of Paolo and Francesca. Her work has often grace and sentiment, but lacks technique and real power.

FAUVEL, fȯ′vĕl′, Sulpice Antoine (1813-84). A French physician. He was born and educated in Paris, and subsequently went to Turkey, where he became a member of the Sanitary Council at Constantinople (1848). Shortly after his return to Paris in 1866, he was appointed inspector-general of the Sanitary Department of the French Government. His works on the Oriental plague, the cholera, which he had closely studied during his long residence in the East, and typhus have been extremely valuable, and have had much influence on the quarantine regulations of numerous governments. His works include: *Le choléra, étiologie et prophylaxie* (1868); *Rapports sur l'organisation du service des quarantaines en Turquie* (1873); *Règlement général de police sanitaire maritime* (1876).

FAUVELET, fȯ′vlȧ′, Jean Baptiste (1819—). A French painter. He was born at Bordeaux; studied under Delacour; and made a specialty of genre and flower painting. His paintings are very small, of exquisite coloring, and highly finished without being hard. Among his pictures are: "A Young Man Reading" (1845); "The Two Roses" (1847); "Nonchalance" (1848); "The Carver" (1850); and "The Prodigal Son" (1869).

FAVARA, fȧ-vä′rȧ. A city in Sicily, 1066 feet above the sea, 6 miles east of Girgenti and 9 miles from the Mediterranean. It mines sulphur, alum, and tourmaline, quarries marble, markets fruit, and has a castle of the Chiaramonte family, who, in the fourteenth century, were politically important. Population of commune, in 1881, 16,000; in 1901, 20,400.

FAVARO, fȧ-vä′rȯ, Antonio (1847—). An Italian mathematician. He was born in Padua, and was educated in that city and at Turin and Zurich. In 1872 he was appointed professor of graphic statics at Padua, and in 1878 he opened a course on the history of mathematics at that university. In 1879 he began to devote himself more particularly to the study of Galileo, and in 1887 was intrusted with the preparation of a national edition of Galileo's works. He prepared more than two hundred memoirs and other works, a large number of which are devoted to the study of Galileo. Among these are the following: *La statica grafica nell' insegnamento tecnico superiore* (1873); *Lezioni di statica grafica* (2d ed. 1877); *Miscellanea Galilciana inedita* (1887); *Nuovi studi Galileiani* (1891).

FAVART, fȧ′vär′, Charles Simon (1710-92). A very prolific French dramatist and theatrical manager, whose wife, Marie Justine Benoîte Duronceray (1727-72), was one of the most noted actresses of the eighteenth century. He wrote, largely in collaboration with her, some hundred and fifty comedies and operettas, of which the more noted are: *La chercheuse d'esprit* (1741); *Les amours de Bastien et de Bastienne,* a parody on *Le devin du village;* and *Les trois sultanes.* His works are published in ten volumes (Paris, 1763-72); a selection of them in three volumes (1813). His *Mémoires et correspondance littéraires* (Paris 1808) is very valuable for the history of the French drama. For his biography, consult Font (Paris, 1894).

FAVERSHAM, fĕv′ẽr-sham. A municipal borough, market town, and seaport of Kent, England, on a navigable arm of the Swale, opposite Sheppey Island, 10 miles west-northwest of Canterbury (Map: England, G 5). Its parish church is a handsome Early-English structure, with curious carvings and a fine spire. Of the Cluniac Abbey, founded by King Stephen, in which he, his wife, and son were buried, there are but slight remains. It has valuable oyster fisheries, and carries on a large trade in fruit and hops. There is also a considerable industry in ship-building and in the making of bricks and cement. It sends much agricultural produce to London. In the vicinity are large guncotton and powder factories. Population, in 1891, 10,478; in 1901, 11,290. Under the name of Favresfield, it was a seat of the Saxon kings, where Athelstan, in 930, held a Witenagemote. Its earliest existing charter dates from the reign of Henry III. Here James II. was arrested and sent back to London after his first attempt to escape to France.

FAV′ERSHAM, William (1868—). An American actor, born and educated in England. In 1888 he came to the United States, and in 1893 joined the Empire Theatre Company, of which he became leading man in 1896. Among the plays in which he appeared are: *The Masqueraders; Under the Red Robe; Lord and Lady Algy; Don Cesar de Bazan;* and *Imprudence.*

FAVIGNANA, fä′vê-nyä′nȧ. The chief of the Ægadian Islands (q.v.), lying about 6 miles off the west coast of Sicily, and about 6 miles long and about 2 miles wide (Map: Italy, G 10). The chief town of the same name, situated on the northern side, is defended by three forts. The population numbers over 5000; the most important industry is fishing. Many caves exist on the island, and in some of them have been found ancient weapons and utensils

FAVO′NIUS, Marcus (?-b.c. 42). A Roman politician, nicknamed 'Cato's Ape,' on account of his servile imitation of the latter's character and conduct. He was a partisan of the Optimates, and opposed all the measures of the first triumvirate. Notwithstanding his personal aversion to Pompey, he fought with him during the Civil War, but upon Pompey's death was pardoned by Cæsar. He took no part in the conspiracy against Cæsar, but after his murder espoused the cause of Brutus and Cassius. He was put to death by Octavius after the battle of Philippi.

FAV′ORI′NUS. A sophist of the time of Hadrian. He was a native of Arelate (Arles), in Gaul, but for many years was a traveler in the East. He was on intimate terms with Plutarch, Herodes Atticus, Demetrius of Alexandria, Aulus Gellius, and with the Emperor Hadrian himself. Only a few fragments of his works have been preserved. His conversations are described at some length by his devoted admirer, Gellius, in the *Noctes Atticæ.*

FAVORITA (fä′vȯ-rē′tȧ), La (It., the favorite). The title of an opera by Donizetti (1840), and the name of the leading character, Leonora de Guzman, the favorite of Alfonso XI. of Castile. She is about to marry Ferdinando, who, when he discovers her relations to the King, retires to a monastery.

FAVOSITES, făv′ȯ-sī′tēz. The most important genus of fossil tabulate corals, characterized by the vertical rows of round pores that perforate the walls of the individual polygonal cells. The animals of this coral formed colonies of rounded or branching form, and in the Silurian and Devonian periods they were important coral-reef builders. Silicified specimens of Favosites, and its near ally, Michelinia, are often found lying loose in the residual soils of Silurian and Devonian regions, and are then known to the farmers of the vicinity as 'fossil bees' nests.' The best-known species are Favosites Niagarensis and Favosites Gothlandicus, of the Silurian, and Favosites polymorpha, of the Devonian. See Plate of Corals, Fossil.

FAVRAS, fȧ′vrȧ′, Thomas de Mahy, Marquis de (1744-90). A French general, born at Blois. He entered the French Army, and became a lieutenant in the Swiss Bodyguards of the Count of Provence, afterwards Louis XVIII. In 1787 he organized and commanded a legion in Holland. Two years later he was accused by the Revolutionary party of conspiracy, condemned to death, and executed.

FAVRE, fȧ'vr', ALPHONSE (1813-90). A Swiss geologist. He was born at Geneva, studied at the Academy there, and was appointed professor of geology in the Academy. He was a correspondent of the French Institute. His researches regarding the geology of the Alpine regions are considered valuable. His more important works include: *Sur la structure en éventail du Mont Blanc* (1865), and *Recherches géologiques dans les parties de la Savoie, du Piémont et de la Suisse voisines du Mont Blanc* (3 vols., 1867).

FAVRE, JULES CLAUDE GABRIEL (1809-80). A French advocate, author, and politician. He was born at Lyons, March 21, 1809, and studied for the bar at Paris, where he took an active part in the July Revolution of 1830. On returning to Lyons, the same year, he became noted for his ardent republicanism. From 1835 Favre was a member of the Paris bar. After the February Revolution of 1848 he was Secretary in the Ministry of the Interior, in which capacity he inspired the circular for which Ledru-Rollin's administration was so severely reproached, investing the commissioners of the Republic with dictatorial authority in the provinces. He was also active as a member of the Committee of Foreign Affairs. After the election of December 10th Favre showed himself a persistent antagonist of Louis Napoleon, and after the flight of Ledru-Rollin became the orator of the Mountain. The coup d'état of December 2, 1851, closed his political career for the time. In 1858 he defended Orsini on his trial for a conspiracy to murder Napoleon III. In the same year he became a member of the Corps Législatif, and a vigorous opponent of the Imperialist policy. In 1868 he founded the Republican journal *L'Electeur*, and he opposed with all his power the policy which led to the breach with Prussia. After Sedan he called for the deposition of the Emperor and the formation of a Government of National Defense. He was chosen Vice-President and became Minister of Foreign Affairs, and carried on negotiations with Count Bismarck; but committed grave blunders, especially in insisting, against the advice of Bismarck, that the National Guard of Paris be allowed to retain their arms, the result being the outbreak of the Commune (q.v.). When Thiers became chief of the Executive, he appointed Favre Minister of Foreign Affairs, and as such he signed the definitive Treaty of Paris at Frankfort, May 10, 1871. He resigned office in July, 1871, and resumed his law practice. Favre was a voluminous writer on social and political subjects. He died at Versailles, January 19, 1880. Among his works may be mentioned: *Rome et la République française* (1871); *Le gouvernement du 4. Septembre* (1871-72); *Conférences et mélanges* (1880). Consult: Maritain, *Jules Favre, mélanges politiques* (Paris, 1882); King, *French Political Leaders* (New York, 1882).

FAVRE, LOUIS (1826-79). A French engineer. He was born at Chêne-Bourg, near Geneva, and studied railroad engineering in France. He displayed great skill in matters of practical engineering at Lyons and elsewhere, and in 1872 was successful in the contest for the contract stipulating the construction of the Saint Gotthard Tunnel within the space of eight years. He conducted this undertaking successfully, but died shortly before its completion.

FA'VUS (Lat., honeycomb, *Tinea favosa*, crusted ringworm). A disease of the skin, chiefly of the scalp, characterized by yellowish, dry incrustations of more or less roundish form, and often cup-shaped, composed of the sporules and mycelia (q.v.) of a vegetable growth, the *Achorion Schönleinii.* The disks of favus are produced with great rapidity, and spread rapidly, if not attended to at the first, over the whole scalp, destroying the bulbs of the hair, which becomes very short and thin and then falls out altogether. Favus spreads only where cleanliness is greatly neglected, and is therefore almost unknown among the better classes. It is very rare in the United States and in England; common in Hungary, Russia, Italy, France, and Scotland. It is far more common among children than among adults. It may occur on the skin of the entire body, and also on the nails. In treating favus, the fungus must be removed with the point of a knife from the free surface of the skin or the nails, and mercurial ointment should be rubbed in. If on the scalp the cure is sometimes attempted by a variety of medicated and simple ointments, and by pulling out the hair by the roots, or 'epilation,' as it is called; but it seems hardly possible in inveterate cases to eradicate the disease without a very long persistence in habits of the most scrupulous cleanliness, and therefore the cure is seldom permanent, though easily attained for the time. Favus is almost always followed by permanent baldness of the parts affected, unlike ringworm (q.v.), which is a minor disease of the same order.

FAW'CETT, EDGAR (1847—). An American poet and novelist, born in New York, May 26, 1847. He was graduated at Columbia in 1867. From an early age he has been a voluminous contributor to journals, and a popular writer of poetry, drama, and fiction. Among his very numerous volumes are: *Short Poems for Short People* (1871); *Purple and Fine Linen*, a novel (1873); *Poems of Phantasy and Passion* (1878); *A Hopeless Case* (1880); *The False Friend*, a successful play (1880); *The New King Arthur*, an opera libretto (1884); *Song and Story* (1884); *Romance and Reverie* (1886); *Songs of Doubt and Dream*, collections of verse; and the novels *Fair Fame* (1894); *Outrageous Fortune* (1894); *The Ghost of Guy Thyrle* (1897). He has also published *Agnosticism and Other Essays* (1889).

FAWCETT, HENRY (1833-84). An English economist, born at Salisbury. He was educated at Trinity Hall, Cambridge, of which he was a scholar; graduated with high mathematical honors in 1856, and was elected a fellow in the same year. Mr. Fawcett was totally deprived of his sight in 1858 by an accident when shooting. Having written and published *A Manual of Political Economy* (1863); the *Economic Position of the British Laborer* (1865); and having been an extensive contributor of articles on economic and political science to various magazines and reviews, he was elected, in 1863, professor of political economy in the University of Cambridge. He unsuccessfully contested for a Parliamentary seat, on Liberal principles, Southwark, in 1857; the borough of Cambridge, in 1862; and Brighton, in February, 1864; but he was returned for the last-named constituency in 1865, and was reelected in 1868. He was unseated at Brighton at the general election of February, 1874, and was elected for Hackney in April of the same year. In 1880 he became Postmaster-General, and conducted the affairs of his office with great zeal and energy. He published, besides his manual, *Pauperism: Its Causes and Remedies* (1871), *Speeches on Some Current Political Questions* (1873), and *Free Trade and Protection* (1878), etc. In his economic writings Professor Fawcett was an uncompromising advocate of free trade and the individualistic economic doctrines with which that policy is associated; in politics he was a Liberal. Consult Leslie Stephen, *Life of Henry Fawcett* (London, 1885).

FAWCETT, Millicent Garrett (1847—). An English writer, born at Suffolk. In 1867 she married Prof. Henry Fawcett, the political economist, and soon afterwards began to take an interest in the woman's suffrage movement. She has published, among other books: *Political Economy for Beginners* (1870); *Tales in Political Economy* (1874); *Janet Doncaster,* a novel (1875); and a *Life of Her Majesty, Queen Victoria* (1895). A volume entitled *Essays and Lectures* (1872) was brought out jointly by Mr. and Mrs. Fawcett.

FAWKES, fąks, Guy, or Guido (1570-1606). An English conspirator. The son of Edward Fawkes, a Protestant ecclesiastical proctor and notary, he was born in York. Under a stepfather's influence he became a Roman Catholic, and after coming into possession and disposing of his father's property, he enlisted as a soldier of fortune in the Spanish Army, serving in Flanders. He returned to England on the accession of James I. (James VI. of Scotland), and became associated with Catesby and other conspirators, who hoped to restore Roman Catholicism by blowing up the King, his Ministers, Lords, and Commons, at the assembling of the Houses of Parliament on November 5, 1605. Fawkes was chosen to be the chief agent in the deed, and when he was arrested all arrangements had been made for applying the fuse to the train leading to barrels of gunpowder which had been stored in a cellar of the Houses of Parliament. Though he at first refused to divulge the names of his companions, he finally succumbed to torture, confessed, and was hanged and quartered, with several of his accomplices, January 31, 1606. Parliament set apart November 5th forever as a day of thanksgiving. The commemoration of the event, although fast dying out, still prevails, especially in cathedral towns, where grotesque effigies called 'Guy Fawkes,' or 'Guys,' with high cap and lantern, after being carried in procession through the streets by fantastically garbed and masked attendants, are committed to the flames of huge bonfires. (See Gunpowder Plot.) Consult: *A True and Perfect Relation* (London, 1606), reprinted, with new materials, as *The Gunpowder Treason* (London, 1679); Howell, *State Trials;* Winwood, *Memorials* (3 vols., London, 1725); *The Fawkes of York in the Sixteenth Century* (London, 1850); Gardiner, *What the Gunpowder Plot Was* (London, 1897); Gardiner, *History of England* (London, 1893-95); and Hazlitt's articles justifying Fawkes, in the November *Examiner* (London, 1821).

FAWNIA, fą'nī-a. The lady-love of Dorastus, in Robert Greene's *Pandosto* (or *Dorastus and Fawnia*). The character suggested the Perdita of Shakespeare's *Winter's Tale.*

FAXWAX, or **PAXWAX.** The ligament sustaining the weight of the head. See Ligament.

FAY, Amy (1844—). An American pianist and author. She was born at Bayou Goula, Miss., and was a pupil of Tausig and Theodor Kullak in Berlin, and of Liszt in Weimar. Afterwards she became established in Chicago, as a teacher of and lecturer on music. Her book, *Music Study in Germany* (1881), is widely known.

FÁY, fī, András (1786-1864). An Hungarian author, born at Kohány, county of Zemplén. He studied philosophy and law at the Protestant College of Sárospatak, was called to the bar, and for a time held an official position at Budapest. Ill health, however, soon led him to resign, and he henceforth devoted his life to literary pursuits and to the cause of national progress. After two volumes of poems appeared a collection of fables, *Mesék* (1820), which first brought him into prominence. His other writings include a tragedy, *A két Báthory* (The Two Báthorys) (1827); several comedies, the best of which is *Régi Pénzek* (Ancient Coins); and the first attempt at an Hungarian society novel, *A Bélteky ház* (The House of the Béltekys) (1832). Fáy was also a constant contributor to literary and scientific periodicals upon important social questions, and contributed largely to the accomplishment of many important reforms, such as the establishment of a national theatre at Budapest, and the introduction of life insurance and of savings-banks into Hungary. Since his death the Budapest savings-banks have established a fund in his memory, the income of which is awarded each year to the most notable literary production of the year, exclusive of *belles-lettres.* Fáy's collected works are contained in eight volumes (Budapest, 1843-44); his novels in a more recent edition (3 vols., ib., 1883). For his biography, consult Badics (Budapest, 1890) and Erdélyi (ib., 1890).

FAY, fȧ, Charles Alexandre (1827—). A French general and military writer. He was born at Saint Jean Pied-de-Port, and was educated at the Military Academy of Saint Cyr, and at the school for the general staff. He was engaged in the topographical work in the Pyrenees, served in Africa, and had his horse shot under him at the battle of Laghouat (1852). During the Crimean War he was aide-de-camp to General Bosquet, and fought brilliantly at the Alma, Inkerman, and in several other important battles. Upon the outbreak of the Franco-German War, in 1870, he was appointed lieutenant-colonel on the staff of Marshal Bazaine, and was taken prisoner at the capitulation of Metz. In 1874 he was charged with the organization of the bureau of the general staff and appointed brigadier-general. On February 1, 1890, he was appointed commander of the Eleventh Army Corps, and was retired in 1892. His literary productions include: *Souvenirs de la guerre de Crimée* (1867); *Etude sur la guerre d'Allemagne en 1866* (1867); *De la* *loi militaire* (1870); *Journal d'un officier de l'armée du Rhin* (1871); *Etude de marches: Jéna, Sedan* (1899).

FAY, Charles Ernest (1846—). An American linguist, born at Roxbury, Mass. He graduated in 1868 at Tufts College (Boston, Mass.), and became instructor in mathematics there in 1868, in modern languages in 1869, and professor of modern languages in 1871. In 1883 he assisted in founding the Modern Language Association, of whose pedagogical section he was elected president in 1890. He was also one of the founders of the Appalachian Mountain Club, and was elected its president in 1878, 1881, and 1893. In 1879 he became editor of the *Appalachia*. His writings include several monographs and papers.

FAY, fī, Joseph (1813-75). A German painter, born in Cologne. He studied at the Academy of Düsseldorf, and under Delaroche in Paris. His first works, ideal in style, include "Geneviève," "Delilah," and "Cleopatra." In this manner he decorated the hall of the Rathaus at Elberfeld with frescoes that have since been destroyed. This was followed by a number of romantic studies, such as "Romeo and Juliet" (1846) and "Marguerite in Prison" (1847). Later in life he devoted himself to genre painting, treating especially subjects from Italian folk-life. He uses landscape as a background with skill, is a good colorist, and skillful brushman.

FAY, Theodore Sedgwick (1807-98). An American poet, essayist, and story-writer, born in New York City. He studied law, but never practiced, and in 1828 became associate editor of the New York *Mirror*, for which he wrote during extended travels in Europe. He was Secretary of the American Legation in Berlin (1837-53), then Minister Resident in Bern, Switzerland (1853-61); and lived for some years in Berlin Among his books are: *Dreams and Reveries of a Quiet Man* (1832); *Norman Leslie*, a tale, long popular, of New York, afterwards dramatized (1835); *Sydney Clifton* (1839); *Countess Ida* (1840); *Hoboken*, a romance (1843); and *Robert Rueful* (1844). To poetry he contributed *Ulric, or the Voices* (1851); to theology, *Views of Christianity* (1856); to history, *Switzerland* (1860) and *History of the Three Germanys* (1889); to education, *Great Outlines of Geography* (1867) and *First Steps in Geography* (1873).

FAYAL, fī-äl′ (Port., place planted with beech-trees; so called on account of some trees mistaken for beeches by the early European colonists of the island). One of the Azores (q.v.), in latitude 38° 25′ N., and longitude 28° 35′ W., situated a little to the west of the island of Pico (Map: Portugal, A 5). It is about 10 miles long; area, 69 square miles. It has a mountainous surface, rising to an altitude of over 3300 feet. Its soil is fertile, producing grain, oranges, potatoes, and onions. There is a scarcity of water and wood. The salubrious climate attracts many visitors. The island has in former times suffered from volcanic outbreaks. Fayal has a population estimated at 26,000. Its chief port is Horta, where the German submarine cable from Borkum to New York has a station.

FAYE, fȧ, Hervé Auguste Etienne Albans (1814—). A French astronomer. He was born at Saint-Benoît-du-Sault (Indre), and was educated at the Ecole Polytechnique, which he left in 1834, before completing his course, to accept a position in the observatory at Paris to which he had been appointed on the recommendation of M. Arago. He made rapid progress in his astronomical studies and investigations, and on November 22, 1843, attracted world-wide attention by the discovery of the periodical comet which bears his name. This discovery won him the Lalande prize and a membership in the Academy of Sciences. In 1848 he became an instructor in geodesy at the Polytechnique, and in 1854 rector of the Academy at Nancy and professor of astronomy in the faculty of science there. He was inspector-general of secondary education from 1857 to 1862, and was appointed professor of astronomy and geodesy at the Ecole Polytechnique in 1873. He served as president of the Bureau of Longitudes in 1876, and chief inspector of higher education in 1877, and in the latter year for a short time was Minister of Public Instruction in the Rochebouet Cabinet. His work covers the entire field of astronomical investigation. It comprises the determination of comet periods, the measurement of parallaxes, and the study of stellar and planetary movements. He advanced several original theories on the nature and form of comets, meteors, the aurora borealis, and the physical constitution of the sun. In collaboration with Charles Galusky he translated Humboldt's *Cosmos* (4 vols., 1846-59), and in addition to numerous contributions to scientific periodicals, published the following important works: *Sur les déclinaisons absolues* (1850); *Sur les cyclones solaires* (1873); *Cours d'astronomie de l'Ecole Polytechnique* (1881-83); *Sur l'origine du monde* (2d ed., enlarged, 1885). See Faye's Comet.

FAYERWEATHER, fâr′wĕth-ẽr, Daniel B. (1821-90). An American merchant and philanthropist, born at Stepney, Conn. He accumulated a fortune as a leather dealer in New York City. He made special bequests to charitable and educational institutions, aggregating more than $2,000,000, and directed that about $3,000,000 more should be placed with three executors for similar distribution. His will was subjected to a remarkable and prolonged contest, which resulted in a complete victory for the beneficiaries.

FAYE'S COMET. A comet discovered at Paris by Faye, November 22, 1843. It is one of the periodic comets, whose return has been observed several times; viz. in the years 1851, 1858, 1865, 1873, 1880, 1888, and 1895. See Comet.

FAYETTE, fȧ-ĕt′. A town in Fayette County, Iowa, 17 miles northeast of Oelwein, on the Chicago, Milwaukee and Saint Paul Railroad (Map: Iowa, F 2). Upper Iowa University (Methodist Episcopal), founded in 1857, is situated here. Fayette has a creamery and agricultural interests. Settled in 1856, it was incorporated as a town in 1874 under a general State law. Population, in 1900, 1315.

FAYETTE. A city and the county-seat of Howard County, Mo., 160 miles west by north of Saint Louis, on the Missouri, Kansas and Texas Railroad (Map: Missouri, D 2). The Howard Payne College for Women (Methodist Episcopal, South), opened in 1844, and the Central College (Methodist Episcopal, South), opened in 1857, are situated here. Fayette has considerable trade in the products of the surrounding agricultural region. Population, in 1890, 2247; in 1900, 2717.

FAYETTEVILLE, fȧ-ĕt′vĭl. A city and the county-seat of Washington County, Ark., 62 miles north by east of Fort Smith, on the Saint Louis and San Francisco Railroad (Map: Arkansas, A 1). It is a popular summer resort, noted for its picturesque situation and mineral wells, and has the Arkansas Industrial University. A national cemetery, containing 1236 graves, 782 of unknown dead, and a Confederate cemetery in the centre of which stands a handsome monument, are situated here. Fayetteville has manufactures of lumber, flour, wagons, foundry products, etc., and a trade in live stock, grain, fruit, and agricultural produce. Population, in 1890, 2942; in 1900, 4061.

FAYETTEVILLE. A town and the county-seat of Lincoln County, Tenn., about 110 miles west of Chattanooga, on the Elk River, and on the Nashville, Chattanooga and Saint Louis Railroad (Map: Tennessee, E 5). It has a fine courthouse, Dick White College, and the Fayetteville Collegiate Institute. The town is the centre of a fertile agricultural district. There are flour-mills, planing-mills, a carriage-factory, etc. Population, in 1890, 2410; in 1900, 2708.

FAYETTEVILLE. A city and county-seat of Cumberland County, N. C., 60 miles south by west of Raleigh, on the Cape Fear River, at the head of navigation, and on the Atlantic Coast Line Railroad (Map: North Carolina, D 2). The State Colored Normal School and the Donaldson-Davidson Academy are situated here. The city carries on a trade in cotton and naval stores, and has extensive manufactures of cotton, silk, cottonseed oil, lumber, furniture, flour, woodenware, tools, etc. There is also a large vineyard. Fayetteville is rapidly increasing in commercial and industrial importance, and extensive improvements are projected, namely, the development of electrical power for manufacturing and lighting from the Buckhorn Rapids above the city, and the canalization of the Cape Fear River from Fayetteville to Wilmington, insuring a depth of eight feet—a work whose cost is estimated at $1,300,000. The initial appropriation of $50,000 has been made by Congress. The city government, under a charter of 1893, is vested in a mayor, chosen annually, and a municipal council, elected on a general ticket. Population, in 1890, 4222; in 1900, 4670.

Settled by the Scotch, and laid out as Campbellton in 1762, Fayetteville received its present name during a visit of Lafayette in 1784, and was incorporated as a city in 1893. In 1831 it was almost completely destroyed by fire. On April 22, 1861, Governor Ellis of North Carolina seized the United States Arsenal here, containing a number of cannon, a large quantity of ammunition, and 35,000 small arms. In 1865, from March 11th to 14th, General Sherman's forces occupied the village, destroying the arsenal and considerable property.

FAY′RER, Sir Joseph (1824—). An English physician. He was born at Plymouth, and was educated at London, Edinburgh, and on the Continent. Entering the medical service of the navy, he served in the military hospital at Palermo during the siege of 1849. He was a member of the Bengal Medical Service from 1850 to 1874; served in the Burmese War of 1852 and in the Indian Mutiny of 1857; and was residency surgeon during the siege of Lucknow. From 1859 to 1874 he was professor of surgery at the Medical College of Bengal, and was successively president and vice-president of the Bengal Asiatic Society. He was appointed surgeon-general and president of the India Office in December, 1874, and in 1901 became physician extraordinary to King Edward VII. His principal works are the following: *Clinical Surgery in India* (1866); *The Thanatophidia of India* (1872), a work on the poisonous snakes; *Lettsonnian Lectures on Fever and Dysentery in India* (1881); and *On the Preservation of Health in India* (1898).

FAYUM, fī′o͞om′, The (Coptic *phiom*, sea, lake). An Egyptian province west of the Nile, in the Lybian Desert. It contains about 840 square miles, and is as celebrated for its fertility and productiveness to-day as it was in antiquity. Fruits of all kinds grow in abundance, and it is the only part of Egypt where the olive attains perfection. The greater part of the district originally formed the bed of Lake Mœris (q.v.), but great embankments constructed by the kings of the twelfth dynasty, especially by Amenemhat III. (q.v.), reclaimed a large amount of land, and a considerable area was also diked off under the second Ptolemy. The modern representative of Lake Mœris is the Birket el-Kerun, or 'Lake of Horns' (so called from its shape), some 34 miles long by 4½ miles wide, which extends along the western and northern sides of the province. The Fayum is watered by the Bahr Yusuf (Joseph's Canal), a channel 207 miles in length, which diverges from the Nile to the north of Siut, enters the Fayum through a narrow opening in the Lybian chain, and then divides into numerous ramifications. From very ancient times the district was the seat of worship of the crocodile-headed god Sobk (q.v.), and its chief town was called by the Greeks Crocodilopolis. Ptolemy II., Philadelphus, established a colony of veterans in the district which he renamed the Arsinoite nome, and its capital, the old Crocodilopolis, was later called Arsinoë. It is now called Medinet el-Fayum. Consult: Petrie, *Hawara, Biahmu, and Arsinoë* (London, 1889); R. H. Brown, *The Fayûm and Lake Mœris* (ib., 1892).

FAZIO, fä′tsê-ō. A tragedy by Dean Milman, published in London, 1815, and first acted at the Surrey Theatre and at Bath, without the author's knowledge or consent, under the title of *The Italian Wife*. It was formally produced February 5, 1818, at Covent Garden, with Miss O'Neill and Charles Kemble in the leading parts. It was suggested by a story in *Varieties of Literature*, published by the *Annual Register*, in 1795. The rôle of Bianca was a favorite with Fanny Kemble and Madame Ristori.

FAZY, fȧ′zê′, Jean James (1796-1878). A Swiss statesman and author. He was born in Geneva, and was educated in Paris, where he began the study of political economy. Upon the spread of the Carbonari (q.v.) to France in 1820, he became affiliated with them, and was active among the opponents of the Government of the Restoration. In 1826 he returned to his native city, where he began the publication of a newspaper called *Le Journal de Genève*. Returning again to Paris some time before the end of the reign of Charles X., he entered actively into journalism. In July, 1830, Fazy was one of the first to sign the protest of the journalists against the ordinance of the King restricting the freedom of the press. He was an active participant in the July Revolution, but energetically favored the establishment of a republic, and opposed the candidature of the Duke of Orléans, after whose elevation to the throne as Louis Philippe he became a member of the Radical opposition. He published the *Revue Républicaine,* and his advocacy of radical republican principles resulted in his being fined and imprisoned. In 1833 Fazy returned to Geneva. There he found the city still in the hands of the Conservative Party, of which the principal elements were the Calvinistic Clericals and the old aristocratic families. His attacks on the Government in the *Revue de Genève,* which he established, finally resulted, after almost ten years, in the overturning of the Conservative Party in October, 1846, and the establishment of the Liberal régime. From that time until the fall of the Liberal Party from power in 1864, the history of Fazy is that of the canton in which, from 1847 to 1853 and again from 1855 to 1861, he held the highest office. He occupied at the same time a prominent place in the Swiss Federation, and was one of the authors of the Constitution of 1848. In his later years he lived quietly, occupying the position of professor of international law at the University of Geneva. Among his published works are *L'homme aux portions: Conversations politiques et philosophiques* (1821); *Voyages d'Ertelib* (1822); *Principes d'organisation industrielle* (1830); and *Histoire de Genève* (1840). Consult Fazy, *James Fazy, sa vie et son œuvre* (Geneva, 1887).

FEA, fā'ȧ, CARLO (1753-1834). An Italian archæologist, born at Pigna. He took holy orders, but afterwards gave himself up entirely to study. His valuable works on archæology consist of the following: *Miscellanea filologico, critica ed antiquaria* (1790-1837); *L'integrità del Panteone rivendicata a M. Agrippa* (1807-20); *Relazione d'un viaggio ad Ostia ed alla villa di Plinio* (1802); an edition of the works of Horace (Rome, 1811); *Della statua di Pompeio Magno del palazzo Spada* (1812); *Iscrizioni di monumenti publici* (1813); and *Descrizione di Roma* (1822).

FEAL AND DIVOT (Scotch *feal,* sod, probably from Swed. *vall,* sward, pasture, and *divot,* turf). A predial servitude, peculiar to the law of Scotland, in virtue of which the proprietor of the dominant tenement possesses the right of turning up and carrying off turf from the servient tenement for the purpose of building fences, roofing houses, and the like. This, as well as the servitude of fuel, implies the right of using the nearest grounds of the servient tenement on which to lay and dry the turf peats or feal. These servitudes do not extend beyond the ordinary uses of the actual occupants of the dominant tenements. They are strictly analogous to the commons, especially the common of turbary of the English common law. See COMMON; PROFIT À PRENDRE.

FEALTY (OF. *fealte, feaute, feelteit,* from Lat. *fidelitas,* faithfulness, from *fidelis,* faithful, from *fides,* faith, from *fidere,* to believe). The obligation which binds the vassal or tenant to his feudal lord; "the very essence and foundation of the feudal association," in the words of Chancellor Kent. The oath of fealty, which was inseparable from almost every feudal tenure of land, took the following form: 'Know ye this, my lord, that I shall be faithful and true unto you, and faith to you shall bear, for the lands which I claim to hold of you, and that I shall lawfully do to you the customs and services which I ought to do at the terms assigned, so keep me God and His saints.' The right of the landlord to fealty is still an incident of tenure in England, although it is not exacted, except from copyholders. It is obsolete in this country. It was retained by statute in some of our States, for a time after their separation from England, but it was not enforced, and the oath of fealty has resolved itself here, as it has in England, into the oath of allegiance (q.v.). Consult Kent, *Commentaries on American Law.*

FEAR (AS. *fær,* Ger. *Gefahr,* danger; connected with Gk. πεῖρα, *peira,* trial, attack, περâν, *peran,* to cross, Skt. *par,* to cross). A term which has been used in two senses in psychology. (1) As one of the cardinal emotions of time (see EMOTION), the opposite of hope, fear is essentially a transient experience, passing of necessity into one or other of the qualitative emotions, alarm and relief. But, since fear and alarm are both unpleasurable, and the passage from the one to the other is not definitely marked in consciousness, fear is also used to designate (2) the state of fear fulfilled, for which alarm is the better term. Fear proper is an unpleasant expectation (q.v.); fear fulfilled is a typical emotion of quality, with characteristic expression. Darwin seeks to explain the bodily phenomena of fear, in part, by appeal to the principles of habit, association, and inheritance. We open the eyes and raise the eyebrows, e.g. that we may see as clearly as possible all that is going on about us. In past generations, fear-stricken men have taken to headlong flight, or struggled violently with their enemies; and the utter prostration, pallor, sweat, and trembling of this exertion still appear when the emotion is set up, though the actual movements of escape or resistance are not made. He admits, however, that the symptoms are directly due, in part, to "disturbed or interrupted transmission of nerve-force from the cerebro-spinal system to various parts of the body." James seems to agree, when he says that "trembling, which is found in many excitements besides that of terror, is quite pathological." The standing on end of the hair in extreme fear Darwin regards as a relic of the bristling up of animals, whose appearance is thus made more terrible to their antagonists.

Fear is exceedingly contagious, as the records of battles and of commercial crises sufficiently show. Morbid fears play a large part in the classification of insanity (q.v.), and are also connected with certain organic and functional diseases of the heart (panphobia). Consult: Darwin, *The Expression of the Emotions* (London, 1890); James, *Principles of Psychology* (New York, 1890); Mantegazza, *La physiognomie et l'expression des sentiments* (Paris, 1885); Mosso, *Fear* (London, 1896).

FEAR, Cape. See Cape Fear.

FEARNE, fẽrn, Charles (1742-94). An English legal author, born in London. He was the son of Charles Fearne, well known as judge-advocate of the Admiralty. The younger Fearne was educated at Westminster School, and made his way to the bar through the Inner Temple. He was a man of many gifts and of more varied attainments than are often found in the masters of the legal profession, and was especially addicted to classical studies and to the making of mechanical inventions, in which he was an adept. Notwithstanding these distractions and a certain love of ease which often paralyzed his energies, his extraordinary legal talents, and especially his capacity for refined analytical reasoning, speedily made him a leader of the English bar. He was only thirty years old when he produced the remarkable *Essay on the Learning of Contingent Remainders and Executory Devises*, on which his fame mainly rests.

It was characteristic of Fearne that he should have devoted himself to the elucidation of the most technical and abstruse doctrine of the law of real property. It was as a piece of artificial mechanism, ingeniously calculated to produce certain practical results, that it attracted him, and he did nothing to furnish it with a philosophical or rational basis—perhaps an impossible task. But his analysis of the doctrine, his arrangement of its parts, and his description of its complicated operation gave it a foremost place in the artificial system of which it formed a part. The essay at once became a standard text-book of real-property lawyers, taking its place with Littleton's Tenures, and Coke upon Littleton, and, in the decade after its publication, went through several editions. It has retained its place as a legal authority, and has had much learning expended upon it by subsequent editors. The best editions are those of Butler (1809-24), and the tenth, by J. W. Smith (1831).

Fearne's success at the bar was equally conspicuous. He was said to have been 'more consulted than any man of his time,' and for a time he enjoyed a great professional income. But he soon wearied of the exclusive devotion to legal pursuits which his position in the profession called for, and allowed his practice to slip away from him, and fell into straitened circumstances. He died at Chelmsford, February 25, 1794, broken in mind and body, at the comparatively early age of fifty-two. His published works include an historical sketch of land tenures in England, an "Impartial Answer" to a letter of "Junius" (published in 1770), and a volume of posthumous legal essays (1797).

FEARNLEY, fẽrn′lĭ, Carl Frederik (1818-90). A Norwegian astronomer. He was born at Frederikshald, and after studying at Christiania, was appointed Hansteen's assistant at the astronomical observatory in that city. After further studies at Bonn and Königsberg, Germany, he returned to Christiania to prosecute his investigations. In 1857 he became professor of astronomy at the university, and in 1861, upon the resignation of Hansteen, succeeded him as director of the Observatory. In 1876 he was appointed chairman of the commission for the geodetic survey of Norway. In addition to numerous essays in Norwegian and German reviews, he published: *Zur Theorie der terrestrischen Refraction* (1884); *Zonenbeobachtungen der Sterne zwischen 64° 50′ und 70° 10′ nördlicher Deklination* (1888).

FEARNLEY, Thomas (1802-42). A Norwegian painter, of English parentage, brother of the preceding, born at Frederikshald. He studied at Christiania, Copenhagen, and Stockholm, and from 1829 to 1830 he was the pupil of Dahl at Dresden. He was a constant traveler, living but little in his own country. His landscapes are fine in color and his treatment is sincere and harmonious. Among the best of them are: "Justedal Glacier" (1829); "View of Romsdalhorn;" "Grindelwald;" "Mountain Landscape;" "View of Stockholm;" "Gravensfjord;" and "Norwegian Waterfall."

FEAST OF FOOLS. A survival into and through the Middle Ages of the spirit of the Roman Saturnalia (q.v.). The details of its observance varied much in different places, but it was everywhere marked by the same broad, boisterous drollery. The donkey played so frequent a part in the pageantry that he often imposed his name on the celebration. (See Ass, Feast of the.) In every instance there was more or less attempt at dramatic representation, the theatre being generally the chief church of the place, and the words and action of the drama being often ordered by its book of ceremonies. Several rituals of this sort are still preserved. That which was in use at Beauvais, in France, has a rubric ordering the priest when he dismisses the congregation to bray three times, and ordering the people to bray three times in answer. As the ass was led toward the altar he was greeted with a hymn of nine stanzas, of which the first runs thus:

Orientis partibus,
Advenavit Asinus,
Pulcher et fortissimus,
Sarcinis aptissimus.
Hé, Sire Ane, hé!

[From the regions of the East—
Blessings on the bonny beast!—
Came the donkey, stout and strong,
With our packs to pace along.
Bray, Sir Donkey, Bray!]

Where the ass did not come upon the stage the chief point of the farce lay in the election of a mock pope, patriarch, cardinal, archbishop, bishop, or abbot. These mimic dignitaries took such titles as 'Pope of Fools,' 'Boy Bishop,' 'Patriarch of Sots,' 'Abbot of Unreason,' and the like. On the day of their election they often took possession of the churches, and even occasionally travestied the performance of the Church's highest office. In some convents the nuns disguised themselves in men's clothes, chanted mock services, and elected a 'little abbess,' who for that day took the place of the real abbess. The feast of fools maintained itself in many places till the Reformation in the sixteenth century. At Antibes, in the south of France, it survived till the year 1644. The scene was a church; and the actors, dressing themselves in priests' robes turned inside out, read prayers from books turned upside down, through spectacles of orange-peel; using coal or flour for incense, amid a babblement of confused cries, and the mimic bellowings of cattle and grunting of pigs. Consult Tilliot, *Mémoires pour servir à l'histoire de la fête des fous* (Lausanne, 1741), and see also Boy Bishop; Misrule, Lord of.

FEAST OF ROSE GARLANDS, The. A painting by Dürer in the Prague Museum (1506), representing the Virgin crowning the Emperor, while the Child places a wreath on the Pope's head, and angels scatter roses over the kneeling attendants. The painting bears marks of Venetian influence.

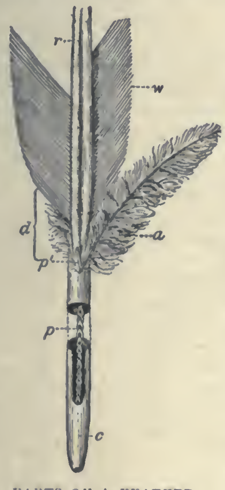
FEAST OF WEEKS. See Weeks, Feast of.

FEASTS. See Festivals.

FEATHER. A river with numerous headstreams which rise in northeastern California, in the Sierra Nevada Mountains, and flow in a generally southwest direction, uniting in Butte County, a few miles northeast of Oroville (Map: California, C 2). From this point the Feather runs nearly due south, receiving Yuba River and Bear Creek on the east, and joining the Sacramento in Sutter County, about twenty miles above Sacramento. The stream is about two hundred miles long, but is navigable only to Marysville, a distance of 30 miles. It flows through one of the richest gold-fields in the State, and the scenery is magnificent along its upper course.

FEATHER (AS. *feþer*, Ger. *Feder;* connected with Lat. *penna*, feather, Gk. *πτερόν*, *pteron*, wing, from *πέτεσθαι*, *petesthai*, Skt. *pat*, to fly). One of the numerous complicated outgrowths from the skin forming the protective coat or plumage of birds, and peculiar to this class. They exist in great variety, and serve various ends in bird-economy, and are applied to diversified uses in human arts and industries.

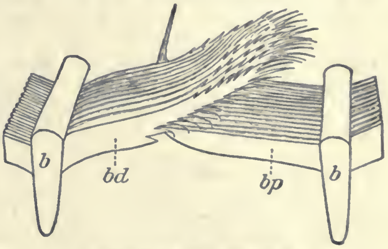
Origin and Structure of Feathers. For the probable origin of plumage as a characteristic and essential element in the class of birds, and its influence on their evolutionary development, see Bird. In the individual birds, as now known, the first sign of feathers appears in the embryo, about the fifth day of incubation of the egg, as slight, backward-leaning, conical pimples which arise from the mesoderm. (See Embryology.) Such a pimple gradually sinks into the skin, forming a follicle with the papilla rising in its centre; and the walls of this follicle and surface of the papilla are formed of Malpighian cells. This central papilla forms the 'feather-pulp,' and its upper portion becomes changed and filled with blood, forming the nutritive organ of the feather. In the space between the pulp and the walls of the follicle the feather is molded, by the hardening and splitting off of the three superficial layers of cells. The innermost and thinnest stratum forms a transparent sheath for the pulp, and persists ultimately as the series of thin caps observable in the stem of a feather. "The middle stratum is the thickest, and becomes the feather itself, while the outermost forms a transparent and coherent cylindrical sheath, which incloses the growing feather, giving it its well-known spine-like appearance ['pin-feather'], until, pealing off as scurf, it sets free the rami (vanes) of the young product" (*Newton*). This is the history of the first growth, but the process is substantially the same for all feathers, which arise from the same pulps. For an account of the periodical shedding and renewal of plumage, see Molting. See also Integument; Skeleton.



PARTS OF A FEATHER.

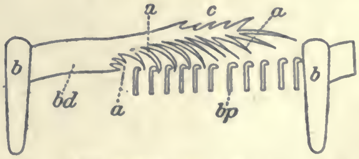
c, calamus or 'barrel,' part of which has been been cut away to show the series of horny 'pith' cups (*p*), continued (at *p'*) through the umbilici form pit, whence arises the aftershaft (*a*); *r*, rachis; *w*, web or vane, each line here representing a 'barb' or ramus; *d*, downy portion.

A complete feather consists of a shaft and a vane. The shaft is made up of the cylindrical hollow barrel or calamus which extends to the beginning of the vane, where it is succeeded by the opaque, pith-filled squarish stem or rachis; in many birds the feather also bears upon the inside of its calamus an aftershaft, or hyporachis, which is a counterpart of the main feather, and occasionally, as in the emeu, may equal it. The vane or web is the blade-like expansion along the sides of the distal part of the feather, and consists of several elements: first, a row of horny lamelli, called barbs or rami, which are wedge-shape in section, the thin edge being turned toward the bird's body. Their number varies: a crane's wing-feather, 14 inches long, has about 650 in its inner web. These barbs bear on each side similar lamelli, called barbules or radii, very minute, and exceeding a million in number for such a feather as the crane's; and each one of these has its upper margin turned over, like a flange, toward the rachis; furthermore, the end of each radius on that side of the ramus which looks toward the tip of the feather is split up into a fringe of hooks that reach over the radii of the next forward row, and hook on to their flanges, thus connecting them all into the firm, springy, and almost air-tight fabric presented by most surface or 'contour' feathers



STRUCTURE OF A FEATHER.

Perspective view of a portion of two adjacent barbs (*b*, *b*), looking from the shaft toward the edge of the vane; *bd*, posterior or distal barbules, overlapping and locking into the proximal or anterior barbules (*bp*) of the next barb.



BARBICELS AND HAMULI.

Oblique section through the proximal barbules in a plane parallel to the distal barbules of the other illustration: *b*, *b*, barbs; *bd*, distal barbules; *a*, *a*, *a*, barbicels and hamuli of the ventral side; *c*, barbicels of the dorsal side, without hamuli; *bp*, barbicels of the proximal barbules.

—especially a 'flight-feather,' as a wing-quill (remex) or a tail-quill (rectrix). Other kinds of feathers, as the soft and fluffy underlying downs, the hair-like, degenerate filoplumes, and scaly or wiry feathers, exhibit the absence of some or all of these connecting parts, or their modification.

The purpose of the feathers is mainly protection from cold and wet; they are exceedingly warm because their substance (resembling horn) is a poor conductor of heat, checking radiation, and because of the air which they contain or entangle forming a blanket of dry air about the body. To enable them the better to resist wet, most birds are provided with a store of grease in the oil-gland (see BIRD), with which they often anoint the plumage. Moreover, the skin of many birds, especially aquatic species of cold climates, is covered with a thick coating of *down feathers*, each of which is composed of a very small soft tube lying in the skin, from the interior of which arises a minute tuft of soft filaments, without any central shaft. This downy covering secures warmth without weight, like the soft fur at the base of the hair of Arctic mammals, and is an adaptive survival of the earliest form of plumage.

The embryo within the shell, and afterwards in the nest, is clothed with 'nestling down,' which consists of short, incomplete, nearly colorless feathers, called neossoptiles, which in some birds grow only on limited spots, or, rarely, do not appear at all; and sometimes they resemble hairs or bristles more than feathers. This first coat soon disappears, being pushed off in the first molt by the growth of the real plumage, which arises from the same places and areas as did the nestling down.

FEATHER TRACTS. Feathers do not grow uniformly over the body as might be supposed, but are arranged in definite areas, called feather-tracts, or pterylæ. These consist chiefly of contour-feathers, but also bear many filoplumes, and sometimes true down. The arrangement of the pterylæ forms a special study in ornithology. known as pterylography. (See BIRD and PTERYLOSIS.) Feathers grow with great rapidity, and in some birds attain a length of more than three feet. They are almost always renewed at least once, and in some cases partially or wholly twice, annually; hence it may readily be conceived how much vital energy must be exhibited in their development, and how critical the period of molting must be. The plumage is generally changed several times before it attains the state characteristic of the adult bird; these changes may occupy a period ranging from one to five years; but some birds attain their adult plumage with the first molt. (See MOLTING.) When the sexes differ in color, as they frequently do, the young birds resemble the duller colored sex, generally the female. When the male in breeding plumage is brighter colored than the female, he usually dons a coat similar to hers after the breeding season is over.

COLORS OF PLUMAGE. The colors of the feathers, to which birds owe their distinctive appearance and beauty, may be due to pigments lodged in the substance of the feather, or it may be the result of a condition of the surface which interferes with the complete reflection of light. To the latter cause is due the metallic sheen of the gorget of a humming-bird, the eyes of a peacock's tail, the 'livelier iris' of the burnished dove. It is, in fact, an iridescence. Notwithstanding their extravascular nature, feathers undergo a change of color after they are completely formed, but such changes obviously cannot be due to any new deposits of pigment in the feather, for it is actually dead tissue. No subject connected with ornithology has been more earnestly discussed in the last few years than the method of color-change in birds. Those who hold that birds can change color by some unexplained changes *in* the feathers are losing ground, however, and those who have given the subject most careful study are agreed in rejecting this theory of *aptosochromatism*, as it is called. It is well known now that most remarkable changes in color are produced merely by the wearing away or abrasion of the tips of the feathers, and this process, combined with the ordinary changes in the molt, is thought to be sufficient to account for all possible color-changes.

Feathers vary in form in different parts of the body, and afford important zoölogical characters for the distinction of species. For those of the wings and tail, and their service in flying, see BIRD; FLIGHT.

USES OF FEATHERS. The chief uses to which feathers are applied in the arts are three—*pens*, due to the peculiar elasticity of the barrels; *bed-feathers*, due to the combined softness and elasticity of the barbs; and *ornament*, due to the graceful forms and delicate tints of the whole feather. The mode of preparing the barrels for pens is described under QUILL.

Bed-feathers were used in England in the time of Henry VII.; but it is not known how much earlier. At the present day, goose-feathers are preferred, the white rather than the gray. What are called *poultry* feathers, such as those of the turkey, duck, and fowl, are less esteemed, on account of their deficient elasticity. Wild-duck feathers are soft and elastic, but contain an oil difficult to remove. The following is one among several modes of preparing feathers for beds: Clean water is saturated with quicklime; the feathers are put into a tub, and lime-water is added to the depth of a few inches; the feathers are well steeped and stirred for three or four days; they are taken out, drained, washed in clean water, dried upon nets, shaken occasionally while drying, and finally beaten to expel any dust. The larger establishments, however, now prepare bed-feathers by steaming, which is found to be a more profitable and efficient process. The *down*, which is of so light and exquisite a texture as to have become the symbol of softness, is mostly taken from the breasts of birds, and forms a warm and delicate stuffing for beds, pillows, and coverlets. The most valuable is that obtained from the eider-duck, described under EIDER.

Feathers used for head-dresses, or other purposes of ornament, are selected according to the forms and colors which they display. The *ostrich*, a very valuable kind of feather, may be taken as an example of the way in which ornamental feathers generally are prepared by the *plumassier*. The mode of catching the bird itself is noticed under OSTRICH; it suffices here to state that the hunters endeavor to avoid injuring the feathers by blood or blows. When brought to market, the feathers are assorted according to quality; those from the back and above the wings are the best, the wing-feathers next best, and the tail-feathers least valued. The feathers of the male are rather more prized than those of the female. They are cleaned for use by repeated soakings and washings in water, sometimes with and sometimes without soap. There is also a process of bleaching by means of burning sulphur. When dried by being hung upon cords, the feathers pass into the hands of the dresser, who opens the fibres by shaking, gives pliancy to the ribs by scraping them with bits of glass, and curls the filaments by passing the edge of a blunt knife over them. If the feathers, whether of the ostrich or any other bird, remain in the natural color, little more has to be done; but if a change of tint be required, the feather is easily dyed. A process of bleaching is adopted before the dyeing, except for black.

The kinds of feathers chiefly used for ornament are those of the ostrich, adjutant, rhea or American ostrich, emeu, osprey, egret, heron, bird of paradise, swan, turkey, peacock, argus pheasant, ibis, eagle, and grebe. White ostrich-feathers are prepared chiefly for ladies' headdresses and black for the Highland regiments and for funeral trappings. The white and gray marabout-stork feathers, imported from Calcutta, are beautifully soft and light, and are in request for headdresses, muffs, and boas; the white kinds will sometimes sell for their weight in gold. The flossy kinds of rhea-feather are used for military plumes, and the long brown wing-feathers for brooms and brushes. Osprey and egret feathers are mostly used for military plumes by hussar troopers. Bird-of-paradise feathers are much sought after by Oriental princes for turban-plumes. Cocks' feathers are also used for ladies' riding-hats, and for military plumes. See AIGRET.

FEATHERS IN COSTUME. Feathers of birds have always formed a part of decorative dress of savages, and of those people removed above savagery, but still of low civilization. The most showy, and perhaps the most tasteful, use of feathers was probably in those 'feather cloaks' of which we read as a gala dress of the natives of tropical and subtropical America at the time of the Spanish Conquest. Similar decorative surfaces have been produced by many peoples of low civilization, who can procure feathers of great brilliancy and variety of color. The feathers need little preparation, and the system of mounting is the very simplest; what is wanted, then, is merely that power of arrangement of brilliant colors which is hardly ever lacking in peoples of low but established civilization. In another direction one of the most tasteful uses of feathers is that of the Zulu warriors, the men of the great military kingdom or empire constituted by Chaka in the first quarter of the nineteenth century. These soldiers, highly organized indeed for native warfare, with weapons especially adapted to their purpose and an admirable system of military command, but defenseless as compared with Europeans armed with long-range rifles, attracted the attention of Europe by their magnificent resistance to the encroachments of the British. They wore no feathers nor other brilliant decoration except in time of actual conflict, when each warrior's head was adorned with as many and as splendid ostrich-feathers as even South Africa could furnish him. Somewhat in like manner the red Indians of North America used the eagle feather, and the placing of these in one or another part of the headdress or at one or another angle showed the tribe to which the wearer belonged.

In Europe feathers have always been used for plumes in the hats or helmets of men and in the headdresses of women, although directly combined with the hair-dressing (which see) or arranged in a hat or cap. In the sixteenth century the flap hats of men of position or of military rank were adorned with drooping plumes dyed of various colors, white being rather the exception, as is denoted by the famous white plume of Henry IV., which was white because that was the color of the House of Bourbon. The epoch from about 1830 to 1850 was distinguished for the wearing of ostrich-plumes upon the head in connection with the most elegant evening dress by the ladies of France and Great Britain. At the same time the *chapeau-bras*, worn sometimes by military officers and sometimes by civilian officers, was decorated with a large ostrich-feather, usually at the front of the flat two-pointed hat and carried along what might be called its ridge, and secured to it at intervals to prevent its floating off at one side. The famous chapeau of Murat, Napoleon's marshal and most famous of cavalry leaders, was adorned with a standing egret (aigrette), on each side of which were drooping ostrich-feathers. The curious and not graceful feather-like plume of certain military hats in the service of Great Britain seem to be composed of feathers much smaller and less showy than ostrich-plumes, and the effect aimed at is a smooth, nearly conical mass. Cock-feathers are used for the hats of the Italian Bersaglieri; the very dark-colored feathers with a curious metallic iridescence being the ones chosen. The egret is, however, more commonly worn by women, and is often set in the most elaborate and costly fashion in gold with precious stones. It is at certain epochs of fashion a headdress of special dignity. It appears that other feathers than the actual tuft of the egret heron are often used. Marabouts are used to adorn the edges of fans, their floating delicacy seeming to add to the lightness of the pretty implement itself. Swans' down, when used to trim gowns and children's dresses, may be considered a humble imitation of the marabout.

The interest in ornithology inspired originally by the work of Audubon has led to the formation of many societies with members pledged to wage a crusade against the killing of birds for the purposes of mere adornment. In some instances the destruction has proved so wanton that the extinction of certain feathered tribes has either followed or been narrowly averted. In the United States a league has been formed looking toward the protection by national legislation of such birds as are likely to become the prey of milliners' agents.

COMMERCIAL USES. Since the introduction of the steel pen and the disappearance of the quill from correspondence, the chief commercial use of feathers other than adornment has been the stuffing of beds, cushions, and quilts. The introduction of the quill toothpick followed as a result of the abandonment of the quill for writing. M. Bardin, of Paris, raised annually two million geese for the purpose of supplying the quills for writing. The substitution of the steel pen threatened to overwhelm him in disaster; and, in seeking for some other use for quills, he hit upon the toothpick.

For upholstery purposes feathers are considered valuable because of their lightness and elasticity. The best combination is that of goose and aquatic feathers. The feathers are plucked in the springtime from the living bird, as these are cleaner and more wholesome than those plucked from dead birds. The feathers of the eider-duck would be the best of all, except for their property of matting. They are therefore more desirable for quilts than for mattresses. When chicken-feathers are used in combination with those of swans, ducks, and geese, the feathery portion is plucked from the quill in order to insure a uniform softness. The feathers are prepared by being subjected to a powerful drying process in a heated compartment. They are then shaken thoroughly. Otherwise they would be likely to breed disease and vermin. Even carefully prepared, they are no longer regarded as the most hygienic mattresses, and the use of hair has become quite general in their stead. Germany, Russia, and France are the chief countries engaged in feather-raising.

FEATHERBACK (so called from the form of the dorsal fin). One of a family (Notopteridæ) of isospondylous fishes of West Africa and the Orient, which form a transition between the least specialized bony fishes and the ganoids. Outwardly they are characterized by their lozenge-like outline, the tail tapering to a point, and the caudal fin being continuous with the long anal. Both the body and head are covered with small scales, the base of the skull is double, the opercular bones are incomplete, and there is no adipose fin. "The air-bladder is divided internally into several compartments, and terminates at each end in a pair of narrow prolongations, of which the anterior ones are in communication with the organ of hearing. A further peculiarity is that the spawn falls into the cavity of the abdomen previous to its exclusion." Three species are known, inhabiting brackish estuaries and lagoons in India and Borneo, and two species in West Africa; none exceeds two feet in length.

FEATHER-GRASS (*Stipa*). A genus of grasses. The species, mostly natives of warm temperate climates, have a peculiarly graceful appearance which is due to the great length of the awns. In some of them the awn is beautifully feathered. This is the case in the well-known species, the common feather-grass (*Stipa pennata*), found on dry hills in the middle and south of Europe. It is a perennial, easy of cultivation, and a favorite ornament in gardens. When gathered before the seeds are ripe, its feathery awns remain attached, so that tufts of feather-grass retain their beauty throughout the winter, and form one of the most pleasing and familiar decorations of rooms. A variety, *Stipa pennata Neo-Mexicana*, is indigenous to the United States. The esparto (q.v.) grass (*Stipa tenacissima*) of Spain is nearly allied to the common feather-grass.

FEATHER-STAR, or ANTEDON. See CRINOIDEA.

FEATH'ERSTONE. A coal-mining town in the West Riding of Yorkshire, England, two miles west of Pontefract (Map: England, E 3). It was the scene of a riot in 1893, which occasioned a royal commission of inquiry owing to the killing of two miners, and the wounding of others, by the military. Population, in 1891, 7500; in 1901, 12,100.

FEATHERSTONE, PETER. A miser in George Eliot's *Middlemarch*. He spends his last years in exciting and baffling the hopes of fortune-seeking relatives.

FEATHERSTONHAUGH, fĕTH'ẽr-stōn-ha̤, GEORGE WILLIAM (1780-1866). An English author, geographer, and traveler in America. He spent the early part of his life in travel in the western part of the United States, and in the Canadian Northwest. In 1834-35 he was employed by the War Department in making geological surveys in the region now included in Wisconsin, Iowa, and Minnesota. In 1842 he was appointed a commissioner to act for the British Government with Lord Ashburton in drawing up the Webster-Ashburton treaty, and to determine the boundary between the United States and Canada under the treaty. For these services he was appointed to the consular service, serving as British consul for the departments of Calvados and Seine, France, where he died. His numerous publications include: a translation of *The Republic of Cicero* (1828); *Geological Report of the Elevated Country Between the Missouri and Red Rivers* (1834); *The Geology of Green Bay and Wisconsin* (1836); *Observations on the Ashburton Treaty* (1842); *Excursion Through the Slave States* (1844); *Canoe Voyage to the Minnesota* (1847).

FEATHERWING. See PLUME-MOTH.

FEB'IGER, JOHN CARSON (1821-98). An American naval officer, born in Pittsburg, Pa. He entered the navy September 14, 1838, and served successively on the *Macedonian*, the *Concord*, the *Chippola*, the *Potomac*, the *Dale*, the *Columbus*, and the *Germantown*, and saw much hard work in South American and African waters. Commissioned a commander August 11, 1862, he successively commanded the *Kanawha*, of the West Gulf blockading squadron (1862-63), which was conspicuous in the engagement in Mobile Bay, April 2, 1862; the *Osage*, *Neosha*, and *Lafayette*, of the Mississippi squadron; and the *Mattabeset* of the North Atlantic blockading squadron, which participated in the spirited engagement with the ram *Albemarle* in Albemarle Sound, N. C., in May, 1864. From 1866 to 1868 he commanded the *Ashuelot*, of the Asiatic squadron. He was made a commodore in 1874, and from 1876 to 1880 was commandant of the Washington Navy Yard. On February 4, 1882, he was promoted to the rank of rear-admiral, and was retired in the following July.

FEBRIC'ULA (Lat., slight fever), or EPHEMERA. Simple, continued fever—a fever of short duration and mild character. It is distinguished by a flushed face, coated tongue, quick pulse, rise of temperature, constipation, and headache, all of which pass away in a day or two, after the use of a mild purge, warm bath, abstinence from all food except milk or peptonoids, and rest in bed. It is generally followed by profuse sweating, and sometimes by an eruption. During epidemics of typhoid fever it is common. It is not well understood. See FEVER.

FEB'RIFUGE (from Lat. *febrifugia*, centaury, a plant supposed to cure fever, from *febris*, fever + *fugare*, to put to flight, from *fugere*, to flee). A medicine calculated to remove or cut short a fever (q.v.). The term was much used before the nature of infection was understood, and before it was understood that a certain amount of fever is necessary to the completion of the chemical process by which oxidation of poisonous products is accomplished. Among the febrifuges are aconite, antipyrin, acetanilid, phenacetin, and sweet spirit of nitre. Some of these are absolutely dangerous in certain fevers, as in the rise of temperature of pneumonia. Quinine is an efficient febrifuge in many cases. In typhoid fever (q.v.) and in pneumonia (q.v.) cold water is an excellent febrifuge; in the former disease the cold bath is the most important part of the treatment.

FEBRO'NIANISM. In theology, a system of doctrine antagonistic to the admitted claims of the Roman pontiff, and asserting the independence of national churches and the rights of individual bishops in matters of local discipline and Church government—in other words, Gallicanism. (See GALLICAN CHURCH.) The name is derived from the nom-de-plume, 'Justinus Febronius,' assumed by Johann Nicolaus von Hontheim (q.v.), Coadjutor Bishop of Treves, in a work on these subjects, which led to a violent and protracted controversy.

FEBRUARY. See CALENDAR.

FEBRUARY REVOLUTION, THE. The revolution of 1848, which brought about the downfall of the July Monarchy in France. The immediate cause was the political contest against the Guizot Ministry. (See GUIZOT.) Its far-reaching results were probably entirely unexpected to all concerned. The agitation leading to the Revolution began in 1847, when the more radical factions held banquets in which a propaganda was carried on for the lowering of the tax-paying qualification for voting, which at this time was 200 francs. Gradually at these banquets the usual royal toasts disappeared, and finally, on February 21-22, 1848, the Government forbade a great reform banquet in Paris. The people were aroused by this arbitrary act of the Ministry, and by the following day the Revolution had become an accomplished fact. Barricades sprang up everywhere in Paris; the workingmen armed themselves, and Guizot was dismissed. It seemed as if the last measure would end the disturbance; but a small riot created the impression that the Government was dissembling, and matters became worse than before. In vain Louis Philippe abdicated in favor of his grandson, the Count of Paris. Nothing would satisfy the populace of Paris now but a republic; and the King, losing heart, fled (February 24th). A Provisional Government was formed, in which the leaders were Arago, Crémieux, Blanc, and others. One party wished merely a republic, but the others demanded that a social revolution follow the political one, and the latter carried the day. On February 26th a decree was adopted, as follows: "The Government of the French Republic undertakes to guarantee the existence of the workman by labor and to provide labor for all citizens," and on the following day national workshops were actually established. Laborers from all over France thronged to Paris, and the Government soon found itself burdened with the support of an army of 100,000 men for whom it could find no work. On May 4th a National Assembly of 900 members was convened and intrusted the government to an Executive Committee of five members, which in its turn was to appoint the Ministers. In this Constituent Assembly the more conservative Republicans obtained control. This led to violent demonstrations on the part of the extremists. On May 15th there was an unsuccessful rising under Barbès, Blanqui and others, having for its object the dissolution of the Assembly. The closing of the national workshops on June 21st was followed by a bloody insurrection, June 24-26, in the course of which more than 4000 workmen perished on the barricades. The Assembly on November 4th adopted a constitution for France. There was to be a President elected for a term of four years, and a single legislative chamber of 750 members. The election was in December, 1848, and the candidates for the Presidency were Ledru-Rollin (Socialist), Cavaignac (Conservative), and Louis Napoleon. (See NAPOLEON III.) The latter carried the election; for the charm of the Great Napoleon's name was on the increase in France, now that the glories of his reign were remembered, and the evils long forgotten. By electing the head of the Imperialist Party, the country virtually decreed the downfall of the Second Republic. See FRANCE.

In other countries of Europe the French Revolution also had a marked effect. Throughout the whole Continent the cause of popular liberty had been suffering from the policy of Metternich (q.v.), and the news from Paris proved to be the impetus necessary to arouse the people. Especially was this true of Germany and Austria. In the former country an attempt was made to carry out the union, which had been hoped for in 1815; but though a parliament assembled at Frankfort 1848-49, it produced no lasting results. In some of the individual States, notably Prussia, constitutions were obtained, which never again disappeared entirely. In Austria Metternich was overthrown, and for a long time Austrian supremacy in Italy and Hungary was seriously menaced. See GERMANY; PRUSSIA; AUSTRIA-HUNGARY; ITALY. Consult: Stein, *Geschichte der sozialen Bewegung in Frankreich* (Leipzig, 1850); Haym, *Die Deutsche Nationalversammlung* (3 vols., Berlin, 1848-50).

FEB'RUUS. The name of an old Italian divinity. His worship was celebrated with lustrations during the month of February, this giving him his name, from *februare*, to purify. The ceremonies instituted in his honor were believed to have the effect of producing fertility in man and beast. Februus was also worshiped as a god of the lower world by the Romans, and identified with the Greek Pluto.

FEBVRE, fĕ'vr', ALEXANDRE FRÉDÉRIC (1835—). A French comedian, after 1867 a member of the Comédie Française. He was born in Paris, and was a musician till he was called above the footlights to fill, it is said, an accidental vacancy. He played for a time in Havre, then in Paris, chiefly at the Ambigu, Beaumarchais, Porte-Saint-Martin, Gaieté, Odéon, and Vaudeville theatres. At the Odéon, especially, he created rôles in *Daniel Lambert* and *Le rocher de Sysiphe*. Having won a reputation, he made, in 1866, his début at the national theatre, as Philippe II. in *Don Juan d'Autriche*. His most frequent successes were in modern comedy, among his creations being rôles in *L'étrangère*, *L'ami Fritz*, *Daniel Rochat*, *Les corbeaux*, *Le roi s'amuse*, and *Margo*. In 1894 he made a tour of the principal cities of Europe. The following year he was sent to the United States to make a study of the American stage. His published works include: *Au bord de la scène* (1889); *Le journal d'un comédien* (1896); and *La clef des champs* (1899).

FÉCAMP, fȧ′käN′ (OF. *Fescamp*, Lat. *Fiscannum*; derived by popular etymology from Lat. *Ficus Campus*, Fig Plain, on account of a legend that a fig-tree, in which some of the precious blood of Christ had been placed by Joseph of Arimathæa, was washed ashore there). A manufacturing town and seaport in the Department of Seine-Inférieure, France, situated in a narrow valley, flanked on either side by steep cliffs, at the mouth of a stream of the same name, on the English Channel, 23 miles northeast of Havre (Map: France, G 2). Its principal buildings are the abbey church of the Benedictines, in the early Pointed style of the period from the eleventh to the sixteenth century; the Church of Saint Etienne, a museum, a library, and a hospital. The harbor is frequented by English colliers and by Baltic timber-ships and fishing-vessels. Fécamp has cotton-mills, oil-mills, distilleries, and various other industrial establishments. Population of the commune, in 1901, 15,381. The town dates from a convent founded in 664, which was destroyed in 841 by the Northmen. In 998 Richard I., Duke of Normandy, rebuilt it as a Benedictine abbey.

FECHNER, fĕк′nẽr, GUSTAV THEODOR (1801-87). A German physicist and philosopher, the founder of modern psychology and psychophysics. He was born in the village of Gross-Särchen, near Muskau, in Lower Lusatia. After completing his school education at the Kreuzschule, in Dresden, Fechner in 1817 entered the University of Leipzig as a student of medicine. Disappointed at the unscientific character of his medical teaching, and strongly influenced by Oken's *Naturphilosophie* and Biot's *Physics*, he soon turned his attention to the study of theoretical and experimental physics, and after Gilbert's death, in 1824, lectured as a substitute for the professor. From this date till 1845 he made valuable contributions to the doctrine of electricity, his well-known *Massbestimmungen über die galvanische Kette* being issued in a single volume in 1831. In 1833 he was appointed associate professor, and in 1834 full professor of physics in the University of Leipzig. In 1838-40 he was engaged upon investigations in the sphere of physiological optics. Meantime he had, under the pseudonym of Dr. Mises, published a long series of humorous and satirical essays, of which we may mention the *Proof that the Moon is Made of Iodine* (1821), a sharp arraignment of the existing state of materia medica, and the *Comparative Anatomy of the Angels* (1825), a work of delicate humor, containing in germ many philosophical ideas which were later put forward with serious intention. In 1839 Fechner published a notable piece of art criticism, and in 1841, as Dr. Mises, a volume of lyric poetry. The years 1840-43 were spent, for the most part, in the sick-room—Fechner had broken down nervously, and was threatened both with blindness and with insanity. His recovery, when it set in, was rapid and complete. He now turned his thought toward philosophy, and issued in 1846 an ethical treatise, *Ueber das höchste Gut*. This was followed in 1848 by the curious but most suggestive work, *Nanna, oder über das Seelenleben der Pflanzen*, in which mentality, of however low an order, is ascribed to the plant world, and this in turn by the *Zend-Avesta, oder über die Dinge des Himmels und des Jenseits* (1851), in which Fechner set forth a comprehensive system of metaphysics from the standpoint of natural science. Here we find the fundamental ideas of what was later to be elaborated as psychophysics. Finally, the work *Ueber die physikalische und philosophische Atomenlehre* (1855) marks Fechner's definitive rupture with the speculative nature-philosophy of Schelling and his school. The remaining years of Fechner's life (1860-87) were devoted principally to the study of psychology and æsthetics. In 1860 appeared the epoch-making *Elemente der Psychophysik* (reprinted, 1889). We have seen that as early as 1838 Fechner was busied with psychophysical problems, and the general question of the relation of mind to body had long been before his mind.

The new science called forth lively discussion, and Fechner's personal views evoked much opposition. In 1877 he published the *In Sachen der Psychophysik*, a reply to objections by Helmholtz, Mach, Brentano, and others, and in 1882 the *Revision der Hauptpunkte der Psychophysik*, a reply to G. E. Müller's *Grundlegung der Psychophysik* (1878). In 1871 appeared *Zur experimentalen Æsthetik*, and in 1876 the profound and comprehensive work, *Vorschule der Æsthetik*. In 1879 came *Die Tagesansicht gegenüber der Nachtansicht*, a summary of the author's religious and metaphysical beliefs. Fechner's last piece of published work was, characteristically enough, an article on Weber's law (q.v.), printed in Wundt's *Philosophische Studien* (Leipzig, 1887). He died in Leipzig, November 18, 1887. An important mathematical treatise, the *Collektivmasslehre*, was issued posthumously, under the editorship of G. F. Lipps (1897).

Fechner's general philosophy has not as yet received the attention that it deserves. His æsthetic work, on the other hand, has borne rich fruit. But his enduring fame will, of course, rest upon the *Psychophysik*. In this work he laid, once and for all, the foundations of an exact psychology. But he did more. He worked out a series of psychophysical measurement methods (see PSYCHOPHYSICS), which are those still employed in our psychological laboratories. He carried out extended researches, which are not only models of scientific patience and caution, but permanent contributions to the literature of psychology. He levied tax upon all departments of scientific inquiry (see PSYCHOLOGY EXPERIMENTAL) for facts and laws which might bear upon the psychophysical relation, bringing order and consistency into the chaos of separate observations.

Consult: Kuntze, *Gustav Theodor Fechner: ein deutsches Gelehrtenleben* (Leipzig, 1892); Lasswitz, *Gustav Theodor Fechner* (Stuttgart, 1896); and for a bibliography of Fechner's works, Fechner, *Elemente der Psychophysik* (2d ed., Leipzig, 1889).

FECHTER, fĕк′tẽr, CHARLES ALBERT (1824-79). A noted actor. He was born probably in London (though accounts from another source say Paris), his father being of German and his mother of Italian descent. He was educated in France, and in 1840 appeared in private theatricals; in 1841 he went with a strolling company to Italy, returning to Paris the same year and entering the Conservatoire with a view to the Théâtre Français. At the same time he studied sculpture, but gave it up for the stage, and in 1844 made his début at the Théâtre Français as Seïde in Voltaire's *Mahomet*. Afterwards he played in Berlin, and in 1847 took a French company to London. In 1847 he married Mlle. Eléonore Rabut, a French actress of note. (She died in 1895.) From 1848 to 1860 he was the reigning favorite in Paris. He was the original Armand Duval in *La dame aux camélias*, in which part he won remarkable success. In 1860 he made his first appearance in English drama in London, in *Ruy Blas*, following with *Corsican Brothers*, *Don César de Bazan*, *Hamlet*, *Othello*, *Bel Demonio*, and other plays, among them an adaptation of his own called *Rouge et Noir*. While not altogether at home on the English stage, Fechter showed himself capable of appreciating the difficulties he had to contend with, and, in some measure, of surmounting them. His impersonation of Hamlet was, upon the whole, one that marked him as an actor of very high powers. For a time he was the lessee of the Lyceum Theatre, playing the chief parts in most of the pieces produced. In 1870 he came to the United States, where, except for a brief return to England two years later, he thenceforward remained. He met with great success as an actor, particularly in Boston; but his imperious temper made him so many enemies that his attempts to manage theatres in both Boston and New York were speedy failures. In 1874, though his first wife was still living, he was married to Lizzie Price, an American actress with whom he had appeared in New York. In 1876, after an accident which somewhat disabled him, he retired to a farm near Quakertown, Pa., where he died. Consult Field, *Charles Albert Fechter* (Boston, 1882).

FECK'ENHAM, John de (c.1518-85). The last abbot of Westminster, and the last mitred abbot who sat in Queen Elizabeth's Parliament. He was born in Feckenham Forest, Worcestershire, about 1518, and his family name was Howman. He became a monk at Evesham, and there took the name by which he is now known. He studied at Oxford. After holding other positions, in 1543 he became chaplain to Bonner, Bishop of London, and when the latter was deprived of his see Feckenham was sent to the Tower (1549). Although for much of the time a prisoner, he was active in political matters. Queen Mary released him and made him her chaplain (1553). In 1556 Queen Mary refounded the Benedictine Monastery of Saint Peter, Westminster, London, and made him mitred abbot. Elizabeth was personally friendly to him, but would do nothing for him, as he would not conform to the new (Protestant) faith. All his influence was thrown against the Reformation and its doctrines. In 1559 he was removed, and sent to the Tower in 1560, and, though released on bail in 1574, was practically a prisoner till his death, at Wisbech, near Elyin, 1585.

FECUNDATION (in plants). See Fertilization.

FEDALMA, *Span. pron.* fȧ-ᴅäl′mȧ. The gypsy's daughter in *The Spanish Gypsy*, by George Eliot.

FEDERAL GOVERNMENT (Lat. *fœderatus*, bound by treaty, from *fœdus*, a treaty). When two or more States, otherwise independent, bind themselves together by a treaty or an organic act so as to present to the external world the aspect of a single State, without wholly renouncing their individual powers of internal self-government, they are said to form a federation. The contracting parties are sovereign States acting through their representatives, and the extent to which the central overrules the local legislature is fixed by the terms of the contract. In so far as the local sovereignty is renounced and the central power becomes sovereign within the limits of the federated States, the federation approaches to the character of a nation; but the only renunciation of sovereignty which a federation, as such, necessarily implies, consists in abandoning the power which each separate State otherwise would possess of forming independent relations with foreign States. "There are," says J. S. Mill, "two different modes of organizing a federal union. The federal authorities may represent the governments solely, and their acts may be obligatory only on the governments as such, or they may have the power of enacting laws and issuing orders which are binding directly on individual citizens. The former is the plan of the German so-called confederation, and of the Swiss Confederation previous to 1847. It was tried in America for a few years immediately following the War of Independence. The other principle is that of the existing Constitution of the United States, and has been adopted within the last dozen years by the Swiss Confederacy. The Federal Congress of the American Union is a substantive part of the Government of every individual State. Within the limits of its attributions it makes laws which are obeyed by every citizen individually, executes them through its own officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely, to produce an effective federal government. A union between the governments only is a mere alliance, and subject to all the contingencies which render alliances precarious."

The difference between these two dissimilar forms of federation is aptly described by the terms employed in German political philosophy to differentiate them, and for which we have no equivalent terms in English—*Staatenbund*, a federation of States, and *Bundesstaat*, a federated State. The federal governments of antiquity and of the Middle Ages were all of the former type, loosely knit confederacies, like those of Athens and the ephemeral combinations of petty Italian States in the thirteenth and fourteenth centuries. Of a similar character is the union of two or more States under a single monarch, as of Castile and Aragon under Ferdinand and Isabella, Austria and Hungary under Francis Joseph, and of Sweden and Norway under the present Swedish dynasty. Confederations of this character have generally proved to be unstable and of short duration, and none of those at present in existence seems likely to prove an exception to this rule. It is to the more enlightened political consciousness of modern times, and especially to the institution of representative popular governments, that the more durable type of federal government—the federated State—owes its existence. The formation of the United States of America under the present Constitution was the first attempt to realize this form of federation on a scale large enough to command the attention of the world, and the great success of the experiment of combining local independence with national power has impressed itself upon the political consciousness of Christendom. Thus, just as the British Constitution has become the model of representative government for the nations of western Europe, the American federation has become the type of federal government for two continents.

One of the chief difficulties which arises in organizing a federal government of either type consists in discovering means by which disagreements between one or more of the local governments and the central government as to the limits of their respective powers are to be disposed of. The arrangement by which this object was sought to be effected in America, of which Tocqueville expressed his admiration, is thus explained by Mill: "Under the more perfect mode of federation, where every citizen of each particular State owes obedience to two governments—that of his own State and that of the federation—it is evidently necessary not only that the constitutional limits of the authority of each should be precisely and clearly defined, but that the power to decide between them in any case of dispute should not reside in either of the governments, or in any functionary subject to it, but in an umpire independent of both. There must be a supreme court of justice, and a system of subordinate courts in every State of the union before whom such questions shall be carried, and whose judgment on them, in the last stage of appeal, shall be final. Every State of the union, and the federal Government itself, as well as every functionary of each, must be liable to be sued in those courts for exceeding their powers, or for non-performance of their federal duties, and must in general be obliged to employ those courts as the instrument for enforcing their federal rights. This involves the remarkable consequence, actually realized in the United States, that a court of justice, the highest Federal tribunal, is supreme over the various governments, both State and Federal, having the right to declare that any new law made or act done by them exceeds the powers assigned to them by the Federal Constitution, and, in consequence, has no legal validity." The tribunals which act as umpires between the federal and State governments naturally also decide all disputes between two States, or between a citizen of one State and the Government of another. The usual remedies between nations—war and diplomacy—being precluded by the federal union, it is necessary that a judicial remedy should supply their place. The supreme court of the federation dispenses international law, and is the first great example of what is now one of the most prominent wants of civilized society—a real international tribunal.

A federal government, then, is a body politic composed of the people of several different, and in some respects independent, States, over which, in its own prescribed sphere, it exerts a supreme authority; while outside of that sphere the States and the people thereof are sovereign within their respective jurisdictions. The character of a federal government varies with the extent of its powers. The first form of 'federal government' established in the United States was that created by the 'Articles of Confederation,' adopted by the Continental Congress in 1777. The separate colonies, finding some form of central government indispensable to the efficient prosecution of the War of Independence, gave a reluctant consent to those articles, which, while the war lasted and all felt the presence of a common danger, worked tolerably, though not without some embarrassing friction arising from notions of colonial or State sovereignty. But after the independence of the country was established, and the pressure of a common danger no longer existed, there was a disposition to exalt the State and to depreciate the national authority, which to some extent was regarded as a burden. The National Government had no judicial tribunal to make an authoritative exposition of its powers, and no executive officers to enforce its decrees; it was entirely dependent upon the voluntary action of the States for means to carry on its operations; so that, in the language of Washington, it was "little more than a shadow without the substance," and "Congress a nugatory body, their ordinances being little attended to." There was, in short, an utter want of all coercive authority on the part of the Government to carry into effect its own constitutional measures. The embarrassments growing out of this state of things were endured till 1787, when a convention of delegates from the several States was held in Philadelphia, "for the purpose of revising the Articles of Confederation and reporting to Congress and the several legislatures such alterations and provisions therein as shall, when agreed to in Congress and confirmed by the States, render the Federal Constitution adequate to the exigencies of the Government and the preservation of the Union." The convention encountered many difficulties arising from diversities of opinion among its members, and from conflicting local interests, but finally succeeded in framing a constitution which the people of the several States finally ratified, and which, with various amendments, has continued to this day. From the time of its adoption different theories of interpretation have prevailed, and these conflicting theories have to a greater or less extent determined the character and aims of political parties. It has been contended on the one side that the Union was merely a league between the several States in their organized capacity, and that each State had the right, at its pleasure, of withdrawing therefrom. On the other side it has been held that the Union, instead of being the creation of the States, as such, was formed by "the people of the United States," acting, indeed, through their respective State organizations, but still as citizens of a common nationality. According to this theory, no right of secession on the part of a State has any existence; but it is the right and the duty of the National Government to maintain the Union by force. This question was brought to an issue in the Civil War, the slaveholding States seeking to exercise the assumed right of secession for the protection of slavery, and the non-slaveholding States taking up arms for the defense of the Union. The results of the war are generally regarded as a vindication of the anti-secession theory, though there are still some disputed questions as to the relative powers of the National and State governments. See *Articles of Confederation*, under UNITED STATES; CONSTITUTION OF THE UNITED STATES.

Other modern examples of federal government are afforded by the Dominion of Canada, founded in 1867 by a union of the provinces of Upper and Lower Canada, New Brunswick, and Nova Scotia, and afterwards enlarged by the accession of the provinces of Manitoba and British Columbia, the Northwest Territories, and Prince Edward Island; by the Commonwealth of Australia, established in 1900 by the organic union of the several Australian colonies of Great Britain; and by the present German Empire, which was born of the sentiment of German nationality evoked by the Franco-Prussian War in 1870-71. See CONSTITUTION; DEMOCRACY; GOVERNMENT; SOVEREIGNTY.

Consult: Mill, *Considerations on Representative Government* (London, 1861); De Tocqueville, *Democracy in America;* Bryce, *The American Commonwealth* (2d ed., New York, 1899); Burgess, *Political Science and Comparative Constitutional Law* (Boston, 1890).

FEDERALIST, THE. A series of essays issued in 1787 and 1788 in favor of the adoption of the proposed Federal Constitution for the United States. The Constitutional Convention at Philadelphia adjourned September 17, 1787; the text of the new Constitution was first published in New York on September 27th; and on October 27th the first number of the *Federalist* appeared in *The Independent Journal*, a semi-weekly newspaper of New York, the successive essays continuing to appear therein until April 2, 1788. All of the eighty-five essays (the concluding eight of which did not appear until the *Federalist* was printed in book form) were published over the name of 'Publius,' but they were composed severally by Alexander Hamilton, James Madison, and John Jay. The authorship of several of the numbers has been the subject of prolonged and inconclusive discussion; but the chief credit for the conception of the enterprise and for its execution has at all times been given to Hamilton. In newspaper and in pamphlet form the *Federalist* had a wide circulation, and its influence was conspicuous in turning popular opinion in favor of the Constitution. Especially in New York, to whose inhabitants it was particularly addressed, it was an important factor in the conversion of the State from anti-federalism to federalism. No contemporary exposition of the text of the Constitution, of the purposes of its framers, and of its relation to the actual development of the State, was so complete, so scholarly, or so authoritative as was that in the *Federalist*. It has, consequently, become recognized, even by the courts, as the most reliable commentary on the Constitution and as an essential aid in the interpretation of such passages as are of obscure or disputed meaning. Many editions have been published, the latest and most useful (containing for the first time a full index of the essays) is that by Paul L. Ford (New York, 1898). In the edition edited by John C. Hamilton (Philadelphia, 1875) there is an elaborate essay on the authorship of the several papers. The discussion is almost as interesting to the antiquary as that concerning the identity of 'Junius.' Useful editions have also been published by H. C. Lodge (New York, 1888) and by E. H. Scott (Chicago, 1895).

FEDERALISTS. In American history, the name given to those who in 1787 and 1788 advocated the adoption of the new Constitution of the United States, and who later contended, for the most part, for a liberal construction of the Constitution and the establishment of a strong National Government. In the end Washington undoubtedly favored their views; but Hamilton, with his plans for a national bank, a sinking fund, the assumption of State debts, and the encouragement of manufactures, was the real leader of the Federalists, while Jay, John Adams, Gouverneur Morris, Ames, and later Marshall were prominent members of the party. The Federalists were conservative in their belief in popular government, and had little sympathy with the French Revolution, being upon these two, as upon other points, opposed by the strict constructionists under the leadership of Jefferson and Madison, known as the Republicans, or Democratic Republicans. (See DEMOCRATIC PARTY.) The Federalists controlled the first three administrations—those of Washington and of John Adams—but the party was disrupted by factional controversies during Adams's Administration, and was overthrown by the Republican victory of 1800, which placed Jefferson in the Presidential chair. Their candidates for President from 1804 to 1816 received scarcely any support outside of New England, and in 1820 no Federalist nomination was made. During these years the party was kept alive in New England by those who had opposed Adams's Administration, and who formed the most aristocratic and pro-English faction. (See ESSEX JUNTO.) Their opposition to the Embargo and kindred measures, and to the War of 1812, culminated in the Hartford Convention (q.v.) in 1814. The convention was immeasurably denounced, and was fatal to the little life still left in the Federalist Party. One of the last appointments of President Adams was that of John Marshall as Chief Justice of the Supreme Court, and during his tenure of that office Marshall succeeded in stamping indelibly upon the Constitution the best portions of the Federalist doctrine. Moreover, the Democrats in power gradually became scarcely less liberal in their interpretation of the Constitution than the Federalists had been before them; and while in 1798 the Federalists denounced the Virginia and Kentucky Resolutions (q.v.) passed by the Democrats in favor of State's rights, in 1814 the Federalists were vigorously opposed to any extension of the authority of the central Government, while the Democrats were wholly committed in this respect to the former Federalist policy.

FEDERAL THEOLOGY. The designation of a type of Dutch Calvinism which developed in the latter part of the seventeenth century. Its chief exponents were Johann Koch (died 1669), Franz Burmann (died 1679), Hermann Wits (died 1708), and perhaps one should add Vitringa (died 1722). The theological system taught by these scholars was in general a system of covenants (*fœdera*) conceived as being made between God and man, whence the name, 'Federal

Theology.' Koch (or Cocceius, as he is commonly known), professor at Franeker, and afterwards at Leyden, is usually regarded as the founder of the school; but the federal idea did not originate with him. Something similar had been taught by Olevianus, one of the framers of the Heidelberg Catechism, by the Swiss theologian Eglin (in his *De Fœdere Gratiæ*, 1613), and by William Ames, an English Puritan, who was professor at Franeker in Koch's student days. John Ball's *Treatise of the Covenant of Grace* proves the early currency in England of a federal system, whose influence is plainly traceable in the Westminster Confession of Faith. It may almost be said that the idea is latent in all Calvinistic theology, although it marks a departure from Calvin's own method by not making the doctrine of predestination its starting-point.

Koch started with the biblical history of redemption, which he arranged under what he called covenants. By the term 'covenant' he meant not so much a mutual agreement between God and man, with reciprocal obligations, as a promise on God's part, conditioned upon obedient acceptance of the promise by man. It is a gift rather than a contract. There can be nothing like a *quid pro quo*, for God's part is infinite and man's finite. As developed by Burmann, the federal system includes: (1) The *Covenant of Works*, made with Adam as the federal head of the race. God would give man eternal felicity, upon condition that man should remain in his first estate of holiness. This covenant was broken by the fall, and was replaced by (2) the *Covenant of Grace* between God and fallen man. Man was not released from his former obligation to obedience, although, owing to the fall, he was rendered incapable of performing it. Hence God in His mercy substitutes grace for works. But in order to render this new covenant possible, God is obliged to send His Son, Jesus Christ, to supply the obedience lacking on the part of fallen man, and to be the full divine sacrifice for sin. This second covenant is arranged in three 'economies'—viz. (a) The ante-legal, or the grace promised to the patriarchs; (b) the legal, presented in the Mosaic system of laws and ceremonies, which are all typical; and (c) the post-legal, including the advent of Christ on earth and the whole of Christian history. To complete the scope of the federal theology, its ruling idea was projected back into eternity by the transcendental conception of a covenant between the Persons of the Trinity, whose aim was the creation and redemption of man. This gave a series of three covenants, under which all history, divine and human, might be subsumed. It constituted a philosophy of history on a much broader plan than has commonly been attempted. This threefold system is a later development from Koch's teaching.

The ideas of Koch and his school were distasteful to the orthodox Calvinists, for they shifted the emphasis away from predestination. Hence the federal theologians were always under suspicion, and sometimes were openly charged with heresy. Koch himself narrowly escaped condemnation. Their chief service to the advancement of Christian thought consists in having broken with scholastic Protestantism, and, in fidelity to the genuine Reformation principle, having once more directed men's minds to the Scriptures themselves. They are not improperly represented as leaders in the study of what is now called biblical theology. Wits (Witsius) and Vitringa are justly honored as the foremost Old Testament scholars of their day. Consult: Cocceius, *Opera Omnia* (Amsterdam, 1673-75; 3d ed. 1701); Zovânyi, *Geschichte des Coccejanismus* (Budapest, 1890); Fisher, *History of Christian Doctrine* (New York, 1896).

FEDERATED MALAY STATES. A name applied to the States of Perak (q.v.), Selangor, Negri Sembilan, with its amalgamated States, and Pahang (q.v.), all of which are under the protection of Great Britain. Situated on the Malay Peninsula (q.v.), they embrace an area of 26,500 square miles, and have a population estimated at 400,000. The country is generally fertile and well watered, and possesses rich mineral deposits, especially in Pahang. The chief products of the States are coffee, pepper, sugar, rice, tin, and gold, and considerable commerce is carried on. The imports for 1898 amounted to $27,000,000 (Mexican), and the exports to $35,000,000 (Mexican). The States are governed by native rulers, who, since 1874, have been assisted by residents appointed by the British Government. These residents are under the control of the Resident General and High Commissioner for the Federated Malay States. There is a State Council in each State, composed of native and British officials. The State of Johor (area, 9000 square miles; population, 200,000), situated at the southern extremity of the Malay Peninsula, since 1885, while under the administration of a sultan, has been controlled by Great Britain only in its foreign relations, but in its internal affairs it is entirely independent.

FEDERATION OF LABOR, American. See Labor, American Federation of.

FEDERMANN, fā'dẽr-mȧn, Nikolaus (1501-c.43). A German traveler in South America. He was born at Ulm, Swabia. From 1529 to 1532 he was in Venezuela, in the employ of the Welsers, merchants of Augsburg, to whom the Emperor Charles V. had granted Venezuela, and made extensive explorations in the interior, the results of which he published in the work entitled *Indianische Historia* (1557; French trans. in the Ternaux-Compans Collection, 1837). In 1534 he again visited Venezuela as the lieutenant of George of Speyer, then Governor-General, and entered upon a second expedition which brought him to New Grenada. By reason of his skill and bravery he secured many trade advantages and acquired considerable treasure. He made many enemies, however, in consequence of his despotism, rapacity, and cruelty, and on returning to Europe (for the purpose, it is said, of obtaining the Governor-Generalship for himself) he was discharged by the Welsers for his perfidy to George of Speyer.

FÉDORA, fȧ'dȯ'rȧ'. A popular play by Sardou, produced in 1882. An English version by Herman Merivale, was produced in 1883. The title character is among the rôles of Sara Bernhardt.

FEDTCHENKO, fĕd-chĕn'kȯ, Alexei Pavlovitch (1844-73). A Russian naturalist and traveler. He was born in Irkutsk, was educated at the University of Moscow, and in 1868-71 made a journey for study and exploration to Turkestan and the lower course of the Sir-Darya or Jaxartes. In 1871 he accomplished a second journey to the desert of Kizil-Kum and to Khokan, proceeded to the western end of the Terek-Davan Pass, which he was the first European to reach, and made his way southward across the Alai Mountains. After his return to Europe he was killed during an ascent of Mont Blanc. The scientific results of his expeditions were published in Russian at Saint Petersburg (1873-76).

FEE, FIEF, or **FEUD** (AS. *feoh*, Goth. *fahn*, cattle, property; connected with Lat. *pecus*, Skt. *paśu*, cattle). In the feudal system of land tenure, a freehold estate in land, held of another and in subordination to certain paramount rights of the latter. These rights, taken together, constituted lordship of the land, while the interest of the subordinate owner was described by the term freehold (*liberum tenementum*), or tenancy. This relation of landlord and free tenant was the correlative of the personal relation of lord and vassal, upon which it was founded, and which it gradually superseded. The lord owed his vassal protection and justice, in return for which he exacted loyal allegiance, and the performance of certain services in accordance with the station and means of the vassal. In the course of time, when the lords became great landowners, these services came to be connected with the lands granted by them to their vassals, and then the lands were regarded as held by such and such services, and the different forms of freehold tenure were described by the service appropriate to each, as the tenure of knight's service, the tenure of grand sergeantry (or grand service: *magnum servitium*), the tenure of free and common socage (i.e. the service of socmen), etc. See FEUDALISM; TENURE.

Understood in this feudal sense—of lands held of a superior lord by some definite service or duty—the fee stands in contrast to the allodial or absolute ownership of land, free from any obligation of service or any relation of vassalage to a superior lord. It is doubtful how far this conception of absolute and independent ownership of lands was ever realized in practice in the Middle Ages; certainly there was none of it in England after the ascendency of the feudal system had become complete. See ALLODIUM.

As the term 'fee' stood for land held in any form of freehold tenure of a superior lord, it was originally applicable to such land, whatever the estate of the tenant might be. Probably the earliest fees were for the life of the tenant only, but the lord might and often did grant them to the tenant 'and his heirs,' in which case they became estates of inheritance. Before long, however, the term fee changed its meaning. As early as the thirteenth century it was commonly used in the sense of an inheritable estate, and this has continued to be its signification to the present day. It no longer denotes an estate held of another, as distinguished from an estate which owes no duty to any superior, but any estate, whether feudal or allodial, which is capable of transmission to the heirs of its owner. But its quality of heritability still depends in common-law jurisdictions on the use of words of inheritance in the instrument creating the estate. A gift to John Doe 'absolutely and forever,' or to him 'and his assigns forever,' will vest in him only a life-estate, while a grant to one and his heirs will give him a fee. This technical rule has been abrogated by statute in many American States, and the more reasonable rule substituted that the intention of the grantor shall govern.

The right of freely alienating fees was not acquired until the quality of heritability had become definitely attached to them. It was finally established by the famous statute *Quia Emptores* (stat. Westminster III., 1290), which granted and ordained that from thenceforth "it should be lawful to every freeman to sell at his own pleasure his lands and tenements or part of them," and at the same time provided that the feoffee, or person to whom the lands were conveyed, should hold them not of his seller, but "of the chief lord of the fee, by such service and customs as his feoffor held before." See FEOFFMENT; SUBINFEUDATION.

A fee with the qualities of general heritability and unlimited alienability is known as a fee simple (*feodum simplex*), and this is the form of estate commonly referred to when the term fee is employed without a qualifying adjective. Side by side with the fee simple, however, there has grown up an inferior kind of fee, with limited rights of inheritance and with restricted rights of alienation, known as a fee tail; but this is now, after six hundred years of existence, dying out. See ESTATE; FEE SIMPLE; FEE TAIL.

In Scotch law the term fee is employed to describe the full right of proprietorship of lands, as contrasted with a life-rent, which is the limited right of usufruct during life. A fee farm is land held by another in fee—that is, in perpetuity by the tenant and his heirs, but subject to a perpetual rent, payable to the lord of whom the land is held. It was a common form of landholding in several of the American Colonies.

Consult: The *Commentaries* of Blackstone and Kent; and Pollock and Maitland, *History of English Law* (2d ed., London and New York, 1899); Digby, *History of the Law of Real Property* (5th ed., Oxford, 1897).

FEEBLE. A tailor, one of Falstaff's recruits, in Shakespeare's *Henry IV., Part II.*

FEEDING FARM ANIMALS. The proper and economical feeding of farm animals is receiving far more attention and is conducted in a much more intelligent manner than formerly. A generation ago stock was pastured during the summer, no grain was given during that season, and in winter hay and straw were fed with such corn or other grain as the farmer raised. While this practice still prevails over a part of the United States, the soiling system (see SOILING) is coming into extensive use, especially in the East, and greater attention is being paid to growing a variety of feeds for stock. Succulent feeds are now generally advocated for use with the dry feed, and the general adoption of the silo provides these, while furnishing the cheapest feed which can be produced on the average American farm. Roots are used to some extent to furnish succulent food, but their growth has increased but little in extent in the United States, although they are extensively grown for feeding in Great Britain. The increasing supply of by-products from oil and flour mills, starch and glucose factories, breweries, etc., has been accompanied by the extensive employment of these materials to supplement the coarser and less concentrated feeds grown on the farm; and the introduction and cultivation of different kinds of leguminous crops, such as clovers, soy bean, cow-pea, alfalfa, etc., has increased the supply of protein, which is the most expensive of the nutrients.

Stock-feeding is an art in which experience and judgment are very important elements of success. The aid of science has been invoked, and, as a result of investigations in animal physiology and the chemistry of nutrition, many of the scientific principles underlying the art have been worked out and formulated. These studies have shown that the animal body is composed mainly of four classes of substances—water, ash, fat, and nitrogenous materials—the proportions of each varying with the age of the animal, treatment, purpose for which it is kept, etc. These materials are being constantly broken down or consumed as a result of the life of the animal. To keep the animal in a healthy and vigorous condition there must be a constant supply of new material, i.e. food, and of the kind of food that furnishes the necessary nutrients. If an animal is growing, or producing milk, or performing heavy work, food is required in addition to that needed to supply the natural waste of the body. The principles of feeding animals rest upon replacement of the natural losses of the body and upon supplying the proper materials for making growth. The various materials used as food for animals contain the same four constituents found in the body, namely, water, ash, fat, nitrogenous substances (protein), carbohydrates (sugar, starch, etc.), and, in addition, fibre. Regarding their functions, it may be said, first, that food, when assimilated, is in part consumed to yield heat and energy for work and action, and in part stored up in the body for repair of the organs and as additional supply of fat, muscle, and other tissues. The sources of heat in the body and energy for work are supplied mainly by the fat and carbohydrates, and, under some conditions, by the protein. The value of fat as a heat-producer is nearly two and a half times that of carbohydrates or protein. The sources of fat in the body are mainly the fat and carbohydrates of the food; the carbohydrates are not incorporated into the body as such, but are changed to fat. The exclusive source of protein, which is the essential constituent of blood, skin, muscle, tendon, nerve, hair, wool, casein of milk, etc., is the protein of the food. Hence the importance of supplying a liberal amount of protein in the food. The excess of protein may be worked over into fat, or it may be consumed by the body to yield body-heat and energy for work. The fibre serves the same purpose as the carbohydrates, and the ash is used in the framework—the bones—and is also a constituent of the blood and other components of the body. The needs of farm animals under different conditions of growth, work, and production have been studied in intricate experiments, and as a result the body requirements, in terms of digestible protein, fat, and carbohydrates, have been largely determined. These requirements have been formulated in the shape of so-called 'feeding standards,' which, while not absolute and inflexible measures of the body needs, are convenient and helpful indications of the amounts of nutrients required per day. The composition, fuel value, and digestibility of the principal feeding stuffs have been determined and are set forth in tables in convenient form for calculating rations. The calculation enables the feeder to determine the relative amounts of the different feeding stuffs which should be combined in making up the ration so as to avoid waste.

Abstract knowledge cannot take the place of experience in stock-feeding, but it will prove of great value when combined with experience, enabling more intelligent practice, and giving a deeper insight and a wider range of vision. The agricultural experiment stations have worked out and tested a great variety of rations for different kinds of animals, and, from studies of the rations which were being fed by farmers, have been able to suggest modifications of them which, while more scientific, were also more economical and effective. It is impossible, in the space here available, to give rations or directions for feeding under the varied conditions which prevail in different localities. The kinds of feeding stuffs available and their cost, and the system of farming which is practiced, all have to be taken into account. Since the farmer usually has sufficient carbohydrate materials, he seeks to increase his supply of protein in the concentrated feeds he buys. The tables of composition will assist him in selecting these materials. In addition to the publications of the experiment stations, several excellent books have been written which treat the subject of feeding from both the scientific and the practical side. Consult: Armsby, *Manual of Cattle Feeding* (New York, 1890); Henry, *Feeds and Feeding* (Madison, Wis., 1902); and "The Feeding of Farm Animals," in *United States Department of Agriculture, Farmers' Bulletin No. 22* (Washington, 1902); Jordan, *Feeding of Animals* (New York, 1901). See CATTLE; DAIRYING; FEEDING STUFFS; HOGS; SHEEP.

FEEDING STUFFS. A general term applied to all kinds of food materials used for farm animals, including so-called 'fodder,' 'forage,' and grain feeds. These materials are very diverse in character. They may be green, wet, or dry; the whole plant, as in the case of hay; only a part, as in the case of root crops; and the seeds of grains, or by-products from various manufactories. They are vegetable for the most part, although ground meat and bone and blood are used to some extent, especially in Europe, and the by-products from the dairy—skim milk, buttermilk, and whey—find extensive use for young animals. The number and variety of feeding stuffs has increased greatly in recent years. Formerly hay, corn fodder, straw, and the cereal grains constituted the main supply, but now the supply of home-grown and commercial feeding stuffs has become exceedingly varied, by the introduction and wide cultivation of a long list of field crops, such as millets, cow-pea, field peas, soy bean, vetch, rape, alfalfa, etc.; by the extensive production of brans from the flour-mills, oil cakes from linseed and cottonseed oil mills; and by numerous by-products from the manufacture of sugar, starch, breakfast foods, beer and malt liquors, which are prepared from corn and cereal grains. New kinds appear upon the market annually, and variations in the method of manufacture cause changes in the composition and character of the by-product.

Feeding stuffs may be classified in a general way as (1) coarse fodders, also called 'roughage,' or 'roughness,' including hays, straw, corn fodder, silage, and similar coarse materials, and (2) concentrated feeds, often referred to as grain feed or 'concentrates,' which include such materials as cereal grains, leguminous seeds, and the by-products mentioned above. These classes of feeding stuffs differ widely in composition, i.e. in the proportion in which the various nutrients are present. They all contain the same general groups of substances, namely, water, protein, fats, carbohydrates (starch, sugar, etc.), fibre, and ash. However dry a feeding stuff may be, it always contains a considerable amount of water, which can be driven off by heat. The amount may be only 10 or 15 pounds per 100 pounds of materials, as in the case of dry fodders, but in green fodders and silage it amounts to nearly 80 pounds, and in some root crops to 90 pounds per hundred. The rest of the material, which contains the nutrients, is dry matter, and since the water varies so widely feeding stuffs are often compared on the dry-matter basis. Protein is the name of a group of materials containing nitrogen; all other constituents are non-nitrogenous or nitrogen-free. Albuminoids, the casein of milk, and lean meat are examples of protein. They are the 'flesh-formers' of the food. The fat includes, besides the real fats, wax, the green coloring matter of plants, and other materials extractable by ether; hence it is usually designated as crude fat. The carbohydrates likewise include a variety of materials, and from the manner of their determination are usually designated in analyses as 'nitrogen-free extract.' The fibre or cellulose is also of this class, but, as it is determined separately, is usually so stated. The ash is the incombustible part of the fodder—the part left when it is burned. It consists chiefly of lime, magnesia, potash, soda, iron, and phosphates, and is used largely in forming bone. These constituents, except the water, are called 'nutrients,' as they are the materials which nourish the body.

The comparison of feeding stuffs, or the proportion in which these nutrients are present, is determined by chemical analysis. A very large number of analyses of American feeding stuffs have been made, and while they show that the same kind of material varies in composition, depending upon the season, the stage of growth and other factors, the following table will serve to show the average composition of a number of the more important kinds:

AVERAGE COMPOSITION OF FEEDING STUFFS

	Water	Ash	Protein	Fibre	Nitrogen-free extract	Fat
GREEN FODDER						
Corn fodder	79.3	1.2	1.8	5.0	12.2	0.5
Redtop	65.3	2.3	2.8	11.0	17.7	0.9
Timothy	61.6	2.1	3.1	11.8	20.2	1.2
Kentucky blue grass	65.1	2.8	4.1	9.1	17.6	1.3
Red clover	70.8	2.1	4.4	8.1	13.5	1.1
Alfalfa	71.8	2.7	4.8	7.4	12.3	1.0
Cow-pea vines	83.6	1.7	2.4	4.8	7.1	0.4
Corn silage	79.1	1.4	1.7	6.0	11.0	0.8
ROOTS AND TUBERS						
Potatoes	78.9	1.0	2.1	0.6	17.3	0.1
Sugar-beets	86.5	0.9	1.8	0.9	9.7	0.1
Mangel-wurzels	90.9	1.1	1.4	0.9	5.5	0.2
Turnips	90.5	0.8	1.1	1.2	6.2	0.2
Ruta-bagas	88.6	1.2	1.2	1.3	7.5	0.2
Carrots	88.6	.1.0	1.1	1.3	7.6	0.4
HAY AND DRY, COARSE FODDER						
Corn fodder	42.2	2.7	4.5	14.3	34.7	1.6
Redtop hay	8.9	5.2	7.9	28.6	47.5	1.9
Timothy hay	13.2	4.4	5.9	29.0	45.9	2.5
Kentucky blue grass hay	21.2	6.3	7.8	23.0	37.8	3.9
Mixed grasses	15.3	5.5	7.4	27.2	42.1	2.5
Red clover hay	15.3	6.2	12.3	24.8	38.1	3.3
Mixed grasses and clover	12.9	5.5	10.1	27.6	41.3	2.6
Alfalfa hay	8.4	7.4	14.3	25.0	42.7	2.2
Cowpea hay	10.7	7.5	16.6	20.1	42.2	2.2
Wheat straw	9.6	4.2	3.4	38.1	43.4	1.3
Oat straw	9.2	5.1	4.0	37.0	42.4	2.3
Cottonseed hulls	11.1	2.8	4.2	46.3	33.4	2.2
GRAIN AND OTHER SEEDS						
Corn (maize) kernel	10.9	1.5	10.5	2.1	69.6	5.4
Barley	10.9	2.4	12.4	2.7	69.8	1.8
Oats	11.0	3.0	11.8	9.5	59.7	5.0
Rye	11.6	1.9	10.6	1.7	72.5	1.7
Wheat	10.5	1.8	11.9	1.8	71.9	2.1
Soy bean (seed)	10.8	4.7	34.0	4.8	28.8	16.9
Pea-meal	10.5	2.6	20.2	14.4	51.1	1.2
BY-PRODUCTS						
Gluten-meal	8.2	0.9	29.3	3.3	46.5	11.8
Gluten feed	7.8	1.1	24.0	5.3	51.2	10.6
Malt sprouts	10.2	5.7	23.2	10.7	48.5	1.7
Brewers' grains, dried	8.2	3.6	19.9	11.0	51.7	5.6
Wheat bran	11.9	5.8	15.4	9.0	53.9	4.0
Rye bran	11.6	3.6	14.7	3.5	63.8	2.8
Cottonseed-meal	8.2	7.2	42.3	5.6	23.6	13.1
Linseed-meal (new process)	10.1	5.8	33.2	9.5	38.4	3.0
Peanut-meal	10.7	4.9	47.6	5.1	23.7	8.0

The protein is the most expensive nutrient, and the percentage of it largely determines the value of the more concentrated feeding stuffs. Another factor which influences the comparative value of feeding stuffs is the digestibility, or the proportions of the several nutrients which are digested by the animal. The digestibility varies widely in the case of different materials. In the case of corn-meal, for instance, 68 per cent. of the protein, 95 per cent. of the nitrogen-free extract, and 92 per cent. of the fat is digested, on an average; while in the case of wheat straw only about 23 per cent. of the protein, 50 per cent. of the nitrogen-free extract, and 35 per cent. of the fat is digested. The undigested portions are of no use in the nutrition of the animal, and are voided as manure. Tables of digestibility have been worked out, covering the more important feeds in general use. For these and further analyses of feeding stuffs, the reader is referred to compilations published by the United States Department of Agriculture.

The large demand for the more concentrated feeds, especially the by-products, has led to adulteration with cheaper and inferior materials, to some extent, and to the use of names which may deceive the purchaser. Cottonseed-meal, for example, has been diluted with a quantity of ground cottonseed-hulls and sold under the name of cottonseed feed, the mixture being greatly inferior to the meal. Furthermore, the by-products vary widely in composition, due to changes in the process of manufacture or to the separation of the germs from the rest, or to the addition of the hulls. These facts have suggested the desirability of legislation which shall require manufacturers to guarantee the percentage of protein, fat, etc., in their products, and which shall provide a feeding-stuff control, similar to that for fertilizers. Such laws have been passed in Massachusetts, Maine, Connecticut, New York, New Jersey, Vermont, and Rhode Island; and protection in the purchase of these materials has been secured thereby. Similar protection is provided by the Fertilizer and Feeding Stuff Act of England, and by a voluntary control in Germany. From time to time various mixed or 'condimental' feeds are extensively advertised, with extravagant claims for their effect on the general health of animals or for their ability to increase milk production greatly. Tonic or medicinal properties are claimed for many of them. They often contain a considerable quantity of salt, and frequently a harmless quantity of fenugreek (q.v.), sulphur, gentian, ginger, and similar substances. None of them are concentrated feeds, in the common acceptance of the term; and Sir John Lawes many years ago showed condimental feeds to be of no advantage to healthy stock. They are usually sold in small packages, the price ranging from 10 to 20 cents a pound, which, from the standpoint of their feeding value, is exorbitant. In spite of this, large quantities of these feeds are sold throughout the United States.

A new class of feeding stuffs has recently come into use in Europe, in which the molasses from sugar-beet factories is a prominent component. Various materials, such as palm-nut meal, bran, ground corn-stalks, and dried beet-chips are used to absorb the molasses and to make the mixture richer in protein. Some of these molasses feeds have given surprisingly good results, and they appear to be relished by stock. Blood has been used to some extent in a similar way. Consult "Feeding Stuffs for Animals," in *United States Department of Agriculture Yearbook, 1894-95* (Washington, 1895-97). See FEEDING FARM ANIMALS.

FEE'HAN, PATRICK A. (1829-1902). An American Roman Catholic archbishop. He was born in Tipperary, Ireland, and was educated at Maynooth College, Kildare. He came to the United States in 1852, settled in Saint Louis, Mo., and became pastor of Saint John's Church in that city. In 1854 he was appointed president of the Seminary of Carondelet, and in 1859 pastor of the Church of the Immaculate Conception. He was consecrated Bishop of Nashville, where he showed his great ability as an organizer in completely reconstructing the diocese, which had become demoralized during the Civil War. With great obstacles to overcome, and with his work made more difficult by three successive epidemics of yellow fever, he made his diocese administratively one of the strongest in the country, and its educational institutions models for parochial schools in other dioceses. He founded the Catholic Knights of America, a lay organization which has spread throughout the United States. In 1880 Bishop Feehan was installed as the first archbishop of the newly created archiepiscopal see of Chicago.

FEELING (AS. *fēlan*, OHG. *fuolen*, Ger. *fühlen*, to feel; ultimately connected with Lat. *palma*, Gk. παλάμη, *palamē*, palm of the hand, Skt. *pāṇi*, hand, AS., OS. *folm*, hand). A term whose variety of meaning has caused much confusion in psychology. It is used (1) for perceptions of touch: we say that a thing 'feels' hard or soft or rough; and we 'feel' for our matches in the dark, or (metaphorically) 'feel' our way in some delicate undertaking. This, the popular usage, would seem to be etymologically correct. It is, however, being discontinued in psychology. (2) The word is used for certain organic sensations of diffuse character, which are ordinarily tinged with strong affection: we speak of 'feeling' hungry, thirsty, fatigued, etc. This usage approximates very closely to (6) below. (3) As touch is the primordial sense, from which all others have been developed, it is but natural that the term feeling, the perception of touch, should be extended to embrace every mode of mental process. Feeling, in this sense, covers all sorts of mental elements, and formations: sensations, affections, perceptions, ideas, emotions, actions, etc. It is being replaced by 'mental process' (q.v.).

In modern psychology, there is a well-marked tendency to restrict the term 'feeling' to some kind of affective process. (See AFFECTION.) So we find (4) a classification of mental functions as those of the intellect, the feelings or sensibilities, and the will: feeling here including emotions, sentiments, moods, and feelings proper. We often say, too, that we 'feel' sorry or glad or depressed; or that we 'feel' the beauty of a landscape or the sublimity of a work of art. (5) Since this usage is unnecessarily wide, we find the meaning of the term restricted. Some authors make 'feeling' the equivalent of the German *reines Gefuehl*, or pure feeling; i.e. define it as affection is defined. (6) It is, however, better to regard feeling as a concrete process, compounded of sensation and affection, and lying in order of complexity next below the emotion (q.v.). It would then be correct to talk of the 'feeling' of drowsiness, or suffocation, or ill health, since in all such cases we have a complex of sensations (for the most part organic), dominated by a pleasantness or unpleasantness. It would, again, be correct to speak of 'feeling' hungry or thirsty or tired (see (2) above), provided that we had in mind the total consciousness of affectively toned organic sensations, and not merely the sensations as such. Consult: James, *Principles of Psychology* (New York, 1890); Wundt, *Outlines of Psychology*, translated by Judd (London, 1898); Titchener, *Outlines of Psychology* (New York, 1899); Kuelpe, *Outlines of Psychology*, translated by Titchener (London, 1895).

FEE′NIX, Cousin. A washed-out beau, in Dickens's *Dombey and Son.* He is cousin to Edith Granger, the second Mrs. Dombey, and makes a speech at her marriage-banquet.

FEER-HERZOG, fâr′hĕr′tsoG, Karl (1820-80). A Swiss statesman and political economist, born at Rixheim, Alsace. After 1852 he was a member of the Grand Council, of which body he was twice elected president. From 1865 until his death, he was the representative of Switzerland in the deliberations of the Latin Monetary Union, and in this capacity was an advocate of the gold standard. In 1867 he was director of the Swiss section of the Paris Exposition, and for more than sixteen years he acted as president of the Financial Commission of Switzerland. His principal works are: *L'unification monétaire internationale* (1869); *La France et ses alliés monétaires en présence de l'unification universelle des monnaies* (1873); and *Gold oder Silber?* (1874).

FEES. The compensation of lawyers and physicians for their professional services. In England neither barristers nor physicians could recover their fees by legal proceedings against their clients or patients, except under a special contract. The ground of this rule was that such fees are regarded not as payment, but as an expression of gratitude for services the value of which cannot be expressed in money. The origin of the rule in the case of the advocates is traced to the relation which subsisted between patrons and their clients in ancient Rome. When the former appeared as the defenders of the latter, they practiced, as Blackstone says (iii. 29), *gratis*, for honor merely, or at the most for the sake of gaining influence; and so, likewise, it is established in England that a counsel can maintain no action for his fees, which are given, not as *locatio vel conductio*, but as *quiddam honorarium;* not as a salary or hire, but as a mere gratuity, which a counselor cannot demand without doing wrong to his reputation. The rule at Rome was maintained even under the Emperors, and Tacitus mentions (*Ann.*, lib. ii. c. 5) that it was directed by a decree of the Senate that these *honoraria* should not in any case exceed 10,000 sesterces, or about $400. It has further been decided in England that no action lies to recover back a fee given to a barrister to argue a cause which he did not attend. But special pleaders, equity draughtsmen, and conveyancers, who have taken out certificates to practice under the bar, and therefore are not counsel, may recover their reasonable charges for business done by them. As regards physicians, the rule that a fee could not be recovered by an action at law was applied in the case of Chorley *vs.* Bolcot, June 30, 1791 (4 T. R. 317). If, however, either a barrister or a physician acted under a special agreement or promise of a certain payment, then an action might be brought for the money. But all medical practitioners were relieved from the above code of honor by the Act of 21 and 22 Vict. 90, which applied to the United Kingdom, and enabled them to recover in any court of law their reasonable charges as well as costs of medicines and medical appliances used. This rule applies to physicians, surgeons, and apothecaries as defined by the statute. Members of the inferior branches of both professions—attorneys, solicitors, etc., on the one hand, and surgeons, dentists, cuppers, and the like on the other—were always entitled to maintain an action for their fees. In Scotland, the same rules prevail as in England with reference to both professions. In France, though the delicate sense of honor of the bar has always been preserved with quite as much care as in England, the rule is somewhat different. In law, an action for the recovery of fees would be maintainable in that country by an advocate; but "in Paris the rule of the ancient bar, founded on the disinterestedness which was its characteristic and according to which any judicial demand of payment of fees was strictly forbidden under pain of erasure from the table (of advocates), has been religiously preserved." There is no law in the United States which puts contracts for services by lawyers or physicians on any different basis from contracts made by other persons. In most of the American States an attorney at law has a lien on the cause of action and on the papers in his hands for the costs of the suit, including his fees. See Attorney; Barrister; Costs.

FEE SIMPLE (Lat. *feodum simplex*). A fee, or estate of inheritance, which has the qualities of general heritability and unlimited alienability. It is distinguished from the fee tail. See Fee Tail.

A fee simple may be *absolute*, in which case it is unhampered by any condition or limitation whatsoever; or it may be *qualified*, or *limited*, as where it is to come to an end upon the happening of a definite event. The *conditional fee* of the early common law, out of which the fee tail has been developed, was a variety of the qualified or limited fee simple. It was a gift of lands to a man and his heirs, provided and so long as he should have heirs of his body. (See Conditional Fee; Donis Conditionalibus, Statute de.) Of this nature is a conveyance to A and his heirs so long as Saint Paul's Church shall stand, or so long as the Republic shall endure, or until a certain charity shall be established.

But, though a fee simple may be made terminable by a limitation, as above described, it is not possible to deprive it of either of its principal incidents of alienability and heritability. No restriction upon either of these is valid, and a condition providing for a forfeiture on alienation or limiting the course of descent, will be wholly disregarded. The same is true of the only surviving feudal incident attaching to fees simple —that of escheat. This will take effect on failure of heirs, irrespective of any attempt to qualify or prevent it. Thus a gift of lands to A and his heirs, with the proviso that on failure of heirs the property shall go to B, will vest an absolute fee simple in A, subject to the right of escheat, and the attempted gift to B will fail. See ESCHEAT; ESTATE.

As a fee simple is the largest estate that a man can have, falling short of absolute ownership only through the operation of the doctrine of tenure, and subject only to the dominant rights of the lord (usually the State) of whom the land is held, it was not possible at common law to grant any remainder or other future estate over after a fee simple. Under modern statutes, however, a fee simple terminable by a conditional event may be followed by another fee simple. See EXECUTORY DEVISE. Consult the authorities referred to under FEE.

FEE TAIL (ML. *feodum talliatum*, abbreviated fee). A fee, or estate of inheritance, in which the inheritance is restricted to the lineal descendants of the tenant. The right of inheritance, which is the principal characteristic of a fee, is not ordinarily capable of restriction, but the fee tail was devised for the express purpose of permitting such a restriction in a limited class of cases. Its object was to tie up estates and keep them in the family of the donor, and it achieved this end by giving effect to a conditional gift of lands to a person and the heirs of his body. This was originally known as a fee simple conditional, and was construed to vest in the donee a conditional estate, which became absolutely subject to his disposition on birth of issue. As such power of disposition was inconsistent with the purposes of the gift, the celebrated statute *De Donis Conditionalibus* ('concerning conditional gifts') was passed in 1285 (stat. Westminster II.) to restrict the power of the donee of such an estate, and to protect the interests of the issue and of the persons upon whom the estate was to go upon failure of issue. This it did by forbidding the alienation of the property by the tenant in tail.

For nearly two hundred years after the passing of this act land settled in the form which it prescribed continued to be held under the fetters of a strict entail. But the tendency of the law, which in Scotland was to strengthen the power of entail, was in England in the opposite direction. For a long time tenants in tail, taking advantage of legal technicalities, were able practically to defeat the limitation in tail by means of a discontinuance. But it was not till the time of Edward IV. that an effectual means of evading the provisions of the act was brought into use; this was achieved by means of a process called a *common recovery* (q.v.). By this process a tenant in tail could bar the entail, and convert the estate into a fee simple. Another mode of barring an entail was by means of a fine (q.v.). It had been declared by the statute *De Donis* that levying a fine of lands should be no bar to the entail; but by 32 Hen. VIII., ch. 36, it was enacted that a fine of lands, when duly levied, should be a complete bar to the tenant in tail and those claiming under him. It is to be observed that the operation of a fine was confined to those claiming under the tenant in tail; those who had rights of reversion or remainder under the grantor of the entail were not excluded by this species of assurance; so that by means of a recovery only could an estate tail be converted into a fee simple. From the introduction of common recoveries till the passing of the Fines and Recoveries Act (3 and 4 Will. IV., ch. 74), a period of more than three hundred years, it was impossible that an estate could be held under the fetters of an entail if the tenant in tail and the next heir chose to combine to defeat the entail. By the Fines and Recoveries Act, the technicalities formerly necessary in order to bar an entail were removed, and a tenant in tail may now, by a simple conveyance, alienate his estate at pleasure.

Estates tail are classified according to the form of the gift. If the limitation be to the heirs of the body of the tenant in tail, without special qualification, it is a *fee tail general;* if it be to the heirs of the body of the tenant and his wife Joan, it is a *fee tail special;* if it be to the male heirs of the body, it is a *fee tail male.* So there may be fees tail special male, fees tail special female, etc. But the limitation must always be to the issue of the tenant in tail. As a fee tail is an abbreviated fee—a less estate, that is to say, than a fee simple—it is, unlike the fee simple, capable of supporting a future estate by way of remainder or reversion. Thus it is possible, even at common law, to make a conveyance of lands to A and the heirs of his body, with remainder, on failure of heirs, to B.

Prior to the Revolution the English law of entails prevailed in the British colonies in America. But, though it still exists in a few States, it has generally been abolished in the United States by statute—in Virginia as early as 1776 and in New York in 1782. In most States it is provided that an attempt to create a fee tail shall result in a fee simple. Consult the authorities cited under FEE.

FEHLING, fā'lĭng, HERMANN (1812-85). A German chemist. He was born at Lübeck, and was educated at Heidelberg. After being associated with the Liebig Laboratory at Giessen, and studying for a time with Dumas at Paris, he became in 1839 professor of chemistry at the Polytechnic Institute, Stuttgart. His most noteworthy researches were in the departments of analytical and industrial chemistry, his process for measuring the amount of glucose in substances being especially well known. (See FEHLING'S SOLUTION.) He edited and published the new edition of the *Handwörterbuch der Chemie* by Liebig, Poggendorff, and Wöhler (1871 et seq.), and translated Payen's *Précis de chimie industrielle* into German (2d ed., 1852).

FEHLING'S SOLUTION (named from its inventor, Hermann *Fehling*). A deep-blue alkaline solution of cupric oxide used to detect the presence and determine the amount of sugar in a given mixture. The solution is best prepared by adding 34.6 grams of copper sulphate made up with water to 500 cubic centimeters, to a mixture of 60 grams of caustic soda and 173 grams of Rochelle salt (sodium-potassium tartrate) likewise made up to 500 cubic centimeters with water. The simpler varieties of sugar reduce the cupric oxide (CuO) contained in this solution to cuprous oxide (Cu_2O), which is insoluble and has a bright-red color. Thus one-half gram of dextrose added to 100 cc. of Fehling's solution prepared as described above would, on gentle warming, completely destroy the blue color of the solution, and cause copper to precipitate in the form of cuprous oxide. Conversely, therefore, if a mixture is submitted to a chemist for examination and he is called upon to determine the amount of dextrose present in it, all he has to do is to determine carefully the volume of Fehling's solution that may be completely decolorized by the given mixture.

Ordinary cane-sugar has no direct action on Fehling's solution. By fermentation, however, or by the action of dilute acids, it may be 'inverted,' i.e. split up into simpler varieties of sugar; and then, of course, it becomes capable of reducing Fehling's solution. The latter may consequently be employed in determining quantitatively all the varieties of sugar, both the simple saccharoses, and the more complex disaccharoses. See CARBOHYDRATES.

FEHMGERICHTE, fām′ge-rĭkte. See VEHMGERICHTE.

FEHMIC (fā′mĭk) **COURTS**. See VEHMGERICHTE.

FEIA, fā′yȧ. A lake of Brazil, in the Province of Rio de Janeiro, about twelve miles south of Campos, a short distance from the coast. It covers an area of about 190 square miles, but is very shallow; its waters teem with fish. It is connected by a canal with the Atlantic on the east, and is in water communication with the Parahyba River on the north.

FEIJÓ, or **FEIJÓO**, fȧ-zhō′, DIOGO ANTONIO (1784-1843). A Brazilian statesman. He was born at São Paulo, took holy orders in 1807, and was a priest in Parahyba, Campinas, and Itú. In 1822 he was appointed Deputy to the Cortes at Lisbon, but resigned from that body with four other Brazilian Deputies upon the declaration of Brazilian independence. As Deputy and representative of the Liberal Party (1826-33) he presented the bills proposing the reform of the municipalities and advocating the abolition of clerical celibacy. On July 4, 1831, he was appointed Minister of Justice, and served until July 20, 1832. He was regent during the minority of Pedro II., from October 12, 1835, to September 18, 1837, during which time his liberal policy was bitterly attacked by the Conservatives. Because of this opposition he finally resigned.

FEILDING, fēld′ĭng, ROBERT (*Beau Feilding*) (c.1651-1712). An English courtier. He commanded a regiment under James II., was a member of the Irish Parliament of 1689, was pardoned by William III. in 1696, but upon his return to England passed a season in Newgate jail. He was convicted of bigamy in 1706. Swift, in *Mean and Great Figures* (*Works*, 1814), has intense scorn for him, and Steele described him in two *Tatler* papers (Nos. 50, 51, August 4 and 6, 1709) as 'Orlando the Fair.'

FEINT, fānt (Fr. *feinte*, sham, from *feindre*, to feign, from Lat. *fingere*, to fashion, Gk. *θιγγάνειν*, *thinganein*, to touch, Goth. *deigan*, to knead, Skt. *dih*, to smear). A military strategic device, designed usually to deceive an enemy, or to cover a real design or purpose. See ATTACK; TACTICS, MILITARY; DEMONSTRATION; BATTLE; STRATEGY.

FEIS-CEOIL, fāsh′k′-yōl′ (Ir., assembly for music, from *feis*, assembly, and *ceoil*, gen. sg. of *ceol*, music). An Irish musical society founded at Dublin in 1897 for the advancement of music, and for the purpose of giving a stimulus to musical studies in that country. It has an annual session at which prizes aggregating £800 are distributed among the successful competitors. There are separate competitions for bands, choirs, vocal and instrumental soloists, and original compositions. It is specially designed to encourage native talent, and is a very successful institution.

FEISI, fī′sē, or **FEIYASI**, ABUL FEIS IBN MUBARAK (1547-95). A celebrated Indo-Persian poet and scholar. He was born in Agra, was deeply learned in many subjects, and received an appointment as Court poet to the Emperor Akbar. He wrote many lyrics, some epics, a commentary on the *Koran*, and translations of the *Māhabhārata* and *Lilivati*. In Professor Max Müller's *Introduction to the Science of Religion* (1870, last ed. 1882) there are a number of metrical paraphrases of the poems of Feisi.

FEITH, fīt, RHIJNVIS (1753-1824). A Dutch poet, dramatist, and romancer, of melancholy humor, in singular contrast to his social and literary good fortune. He was born at Zwolle, where, after graduation at Leyden (1770), he became burgomaster in 1780, and published in 1783 *Julia*, the Dutch *Werther*, steeped in romantic gloom. This he followed by tragedies, *Thirsa* (1784), and *The Patriots* (1785), and another Werther novel, *Constantia* (1785), which made him the most popular poet of Holland, but provoked bitter criticism for their morbid sentimentality. After six years' silence he published a third tragedy, *Lady Jane Grey* (1791), and a portentous churchyard poem in four cantos, *The Grave* (1792). Other tragedies and a didactic poem in six cantos on *Old Age* (1802), with five volumes of miscellaneous poems (1796-1814), and *Poems for Public Worship* (1804), complete his works, of which an edition (13 vols.) appeared in 1825. Though now neglected, he is interesting as the Dutch representative of the mood that in Germany produced Novalis (q.v.).

FEJÉR, fĕ′yār, GYÖRGY (1766-1851). An Hungarian scholar. He was born at Keszthely (Zala), and became professor, and afterwards librarian, at the University of Budapest, where he devoted the greater part of his life to the preparation of the *Codex Diplomaticus Hungariæ* (45 vols., 1829-44), which did much to place Hungarian history upon a documentary basis.

FEJÉRVÁRY DE KOMLÓS-KERESZTES, fĕ′yār-vȧ-rĭ de kôm′lōsh-kĕr′es-tĕsh, GÉZA, Baron (1833—). An Hungarian general, born at Josefstadt. In recognition of his services at Solferino he was ennobled, and in 1865 was appointed major, and aide-de-camp to the Emperor. Soon afterwards he became secretary in the Ministry of National Defense, and in 1884 was advanced to the rank of lieutenant-general. In the same year he succeeded Raday as Minister of National Defense of Hungary. In this position he succeeded in greatly elevating the standard of the Hungarian militia.

FELANITX, fā′lȧ-nēch′ (ancient *Canati*). A town on the island of Majorca (q.v.), in the Province of Baleares, Spain (Map: Spain, G 3). It is situated in a valley surrounded by mountains, and is well built, with a number of squares, one of which has a fountain. The municipal building and the parish Church of San Miguel are among the more pretentious structures. On a neighboring hill is an old Moorish castle with subterranean vaults. Felanitx has some trade in agricultural products and wine, and manufactures liquors, pottery, cloth, soap, lime, etc. Stock-raising and fishing also are carried on. Puerto Colom, its port, has a safe but shallow harbor. Population, in 1900, 11,558.

FELCH, Alpheus (1806-96). An American jurist, born in Maryland. He graduated at Bowdoin College in 1827, and removed to Michigan, where he served in the State Legislature in 1836-37, and for some time was one of the State Bank Commissioners in which capacity he exposed many frauds under the banking law. Later he was elected Governor of the State (1846), but before the expiration of his term resigned to enter the Senate, in which he served six years (1847-53). He was then made president of the commission appointed to adjust the Spanish and Mexican land claims growing out of the provisions of the Treaty of Guadalupe-Hidalgo, and from 1879 to 1883 was professor of law in Michigan University.

FEL′DER, Cajetan, Baron (1814-94). An Austrian politician. He was born and educated at Vienna, and became lecturer on political history, statistics, and international law at the university there. In 1868 he succeeded Zelinka as burgomaster of Vienna, in which capacity he contributed to the extension and embellishment of the city, the improvement of the water-supply, and to reforms in various municipal departments. In 1869 he became a member of the Upper House, and in 1878 Marshal of Lower Austria. He wrote *Die Gemeindeverwaltung der Reichshaupt- und Residenzstadt Wien* (2d ed. 1872; two additional volumes, 1875-78).

FELDKIRCH, fĕlt′kĭrk. A town of Vorarlberg, Austria, picturesquely situated about 1500 feet above the sea, in a rocky pass, which forms a natural fortress of great strength, on the river Tel, near its junction with the Rhine (Map: Austria, A 3). It is 23 miles west-southwest of Bregenz. There are a handsome Rathaus and a Jesuit training college (Stella Matutina). The town's industries include flour, woolen, and saw mills. Above Feldkirch rises the ruined castle of Schattenburg, once the seat of the counts of Montfort. Population, in 1900, 4617.

FELDSPAR, fĕl′spär (Ger. *Feldspath,* from *Feld,* field + *Spath,* MHG. *spāt,* laminated stone; connected by popular etymology with *spar*). A group of minerals, all the species of which consist of silicate of aluminum in combination with one or more of the following metals: Sodium, potassium, calcium, or barium. The various species and their numerous varieties, all of which occur originally in igneous or metamorphic rocks, resemble each other closely in respect of general form, texture, etc. Their hardness is not quite that of quartz, and their specific gravity varies between 2.5 and 2.9, while their colors range from white, through pink, yellow, green, and red, to dark greenish-brown. According to their crystalline form, the different varieties are divided into monoclinic and triclinic feldspar, and under each of these heads they are grouped into species, according to their composition. *Orthoclase,* a potash feldspar, is the most common kind, occurring in monoclinic crystals of glassy, white, pink, and flesh-red color, in granite, gneiss, syenite, and many volcanic rocks. *Adularia,* or moonstone, is a white variety of orthoclase that, because of its pearly, opalescent reflections, is cut as a gem. *Microcline,* a triclinic potash feldspar, has a green variety, amazon stone, found in granite at Pike's Peak, Colo., and in the Ural Mountains; this variety is also cut as a gem stone.

The plagioclase feldspars, embracing albite, oligoclase, andesine, labradorite, anorthite, and their several varieties, are soda-lime feldspars that vary in composition between the *albite,* which is high in soda and low in lime, and *anorthite,* which is low in soda and high in lime. Among the members of this group, labradorite is the most important, as it forms a large part of the volcanic rocks of *Pre-Cambrian* age, such as those in the Adirondack region of New York and in many other similar localities of America and Europe. Some varieties of labradorite exhibit on the polished surface a beautiful play of iridescent colors, and have on this account been employed to a considerable extent as ornamental stones.

All the feldspars weather readily under the action of both atmospheric agencies and acidulated surface waters, and yield a form of clay known as kaolin, which is of great economic importance in the pottery industries. Unaltered feldspar, especially such as occurs in veins in granite and gneiss, is quarried, crushed, washed, and made into a paste that is applied to the surface of pottery to form the glaze. See Kaolin; Porcelain; Pottery; and the names of the different forms of feldspar mentioned above.

FÉLEGYHÁZA, fā′lȧgsh-hä′sȧ, or **KISKUNFÉ,** kĭsh′ko͞on-fȧ. A town in Hungary, about 65 miles southeast of Budapest (Map: Hungary, F 3). It has a considerable trade in fruit, grain, wine, and tobacco. The surrounding country furnishes rich pastures, and cattle-raising is an important industry. Population, in 1890, 30,326; in 1900, 33,242.

FÉLIBIEN, fȧ′lė′byăN′, André (1619-95). A French architect and historiographer. He was born at Chartres, and was a protégé of Fouquet and Colbert. He became historiographer of buildings, secretary of the Academy of Architecture (1671), and director of the Cabinet of Antiques. He wrote a great number of works on architecture, painting, and sculpture, which, apart from their historical value, faithfully reflect the opinions of the Royal Academy, of which he was long the recognized exponent. Of these the following are the more important: *Entretiens sur les vies et sur les ouvrages des plus excellents peintres, anciens et modernes* (1666-1688); *Principes de l'architecture, de la sculpture, de la peinture, etc., avec un dictionnaire des termes propres* (1676-90).

FÉLIBRES, fȧ′lė′br', Les. See Félibrige.

FÉLIBRIGE, fȧ′lė′brėzh′. An association founded at the Château of Fontségugne, near Avignon, on May 21, 1854, and organized in its present form at Avignon on May 21, 1876. Its purpose is stated in the first article of its constitution: "to bring together and to encourage those who by their writings preserve the language of the land of Oc, and also those scholars and artists who study and work in the interest of this region." The *langue d'oc,* so called because of the word for 'yes,' *oc,* has never ceased to be spoken in a multitude of dialects all over the south of France, and it is estimated that to-day some ten millions of persons know and use this language in one or another of its forms. No literature of any real value or importance was written in language never entirely died out as a written Provençal from the middle of the fourteenth century to the beginning of the nineteenth, but the language. Joseph Roumanille, born in 1818, at Saint-Remy near Avignon, first conceived the idea of purifying and perfecting the dialect of his own region. Surrounding himself with a few enthusiastic friends, he strove to systematize its grammar and orthography, and, above all, to produce works of genuine poetic value that should speak to the hearts and souls of the humbler classes in the lower Rhone Valley as no poems in French could ever do. He himself wrote several volumes of verse, and in 1852 edited a collection of Provençal poems by various authors, called *Li Prouvençalo.*

These works form the starting-point of a remarkable linguistic and literary revival. The example set by Roumanille fired the imagination of a young friend and pupil of his, destined to become a poet of genius and power, Frédéric Mistral, who forthwith devoted his life to the cause.

The names of the seven poets who met at Fontségugne are Joseph Roumanille, Frédéric Mistral, Théodore Aubanel, Eugène Garcin, Anselme Mathieu, Paul Giéra, and Alphonse Tavan. In 1868 Garcin published a violent attack upon the Félibres (Bookmakers), as the members of this association styled themselves, accusing them of disloyalty to France, calling them secessionists. The name of Jean Brunet was therefore substituted for that of Garcin in the official list of the founders.

The word Félibre was furnished by Mistral, who had found it in an old canticle, wherein Jesus is referred to as disputing with the seven *Félibres* of the law.

Besides the task of pruning and purifying the dialect, the Félibres had to create a public for their works. To this end they set about publishing an annual called the *Armana Prouvençau,* which began with an edition of a few hundred copies, and has now reached a circulation of many thousands. In 1859 Mistral published his first long narrative poem, "Mirèio" ("Mireille"), which met with very great success, being praised in the most glowing terms by Lamartine, so that the Provençal Renaissance became known to the literary circles of Paris, and soon to the world in general. From this time on the output of verse in Provençal steadily increased; scores, nay, hundreds of writers appeared, and to-day the bibliography of the Félibrean literature fills a large volume.

The movement speedily found adherents, not only in southern France, but even in Spain, where the Catalan poets established Floral Games in 1859, and were soon recognized as brothers by the Félibres. In 1867 the distinguished Catalan poet and patriot Victor Balaguer was received with enthusiasm at Avignon and elsewhere, and on his return home sent the Félibres a silver cup, which has become the sacred emblem of the association and which, at the annual Félibrean banquets after the song is intoned, passes from hand to hand.

In 1876 the formal organization was effected. There is a consistory of fifty members called Majoraux, which elects its own members; the consistory is presided over by the Capoulié. All the Félibres are divided into the three *Maintenances* of Provence, Languedoc, and Aquitaine. A fourth *Maintenance*, that of Limousin, is likely to be formed soon. Any seven Félibres dwelling in one locality may ask the *Maintenance* to form them into a *School.* Every seven years floral games are held, when a poet is crowned laureate. He chooses the queen of the Félibrige, who is the living symbol of beauty for the Félibres, as was the lady of his choice for the troubadour in the days of courtly love.

The Capouliés have been: Mistral from 1876 to 1884, Joseph Roumanille from 1884 to 1891, Félix Gras from 1891 to 1901, and Pierre Devoluy, who holds the office at present.

The language used by Mistral and the Félibres is based upon the dialect of Saint-Remy. It is not the language of the Troubadours any more than an Italian dialect spoken to-day in Lombardy is the language of Dante, though it belongs, of course, to the same general family. The Troubadours used mainly the Limousin dialect, and the dialect of the country east of the Rhone is not descended from that. Furthermore, six centuries have elapsed since the days of the old poets, bringing great changes in the speech of the people. The influence of French has been naturally overwhelming. Mistral deliberately set to work to purify his dialect, casting out forms due to the influence of French, and to render the rustic speech of his home capable of literary expression. The result is a language exceedingly rich in vocabulary, full of terms expressive of what is exclusively Provençal. It is, however, an artificial, literary language that does not represent exactly the speech of any one, although readily understood by nearly all the inhabitants of the region. As the movement progressed more and more writers claimed the privilege of writing in their own unaltered dialects, and these numerous *patoisants* stand in the way of any real unity of language.

But the language of the Félibres tends to prevail because of the sheer superiority of their literature. They count among their number one poet of very high rank, who has revealed the wonders and beauty of the land, the charm of its legends and history, the traits of its people, in verse of great originality and exquisite literary finish. Aubanel and Roumanille were real poets; Félix Gras wrote a number of long, ambitious poems, but succeeded best in the historical romance, and is possibly the best prose writer among the Félibres. Song-writers and story-tellers abound. An astonishing number of magazines and periodicals bear witness to the ceaseless activity of these enthusiastic writers.

The exuberance of the southern temperament finds full expression in this Félibrean literature. It is the literature of sunlight, healthy in tone, and reflects all that is best and noblest in the race. Its ideals are high, and its aim is ever to glorify the little fatherland, its history, traditions, customs, ideas, and language. It has undoubtedly quickened the intellectual life of southern France.

This modern literature in no way continues the literature of the Troubadours. Mistral's first inspiration lay in his love of Homer and Vergil; he and his fellow-poets were long indifferent to the Troubadours, and even while extolling the glories of the past they have written for the Provence of to-day. Mistral at least has succeeded in combining this modernism and localism with classic beauty of form, and it would be difficult to find an instance of a more thoroughly original and independent creation in the history of letters.

The only adequate history of the Félibrige is that of G. Jourdanne (Avignon, 1897). Mistral has published a large dictionary, *Trésor dou Félibrige* (Aix, 1879-86); and there is a *Grammaire historique de la langue des Félibres* by Koschwitz (Greifswald, 1894). Consult also Koschwitz, *Ueber die provençalischen Feliber* (Berlin, 1894).

FELICE, fâ-lē′châ, FORTUNATO BARTOLOMMEO (1723-89). An Italian author, born in Rome, of a Neapolitan family. He studied at Rome and Naples under the Jesuits, and in 1746 became professor of physics at Naples after taking orders at Rome. He met with great success, was hailed the wisest man in Italy, and refused the offer of a bishopric. But he fell violently in love with a young Roman matron, the Countess Panzutti, whose husband had put her in a monastery; ran away with her; narrowly escaped capture at Lyons and Geneva; and was finally overtaken at Genoa. Felice was acquitted by the Italian ecclesiastical court, but felt that his career in the Church was ruined, so he went to Bern, became a Protestant, and in 1762 established a famous press at Yverdon. He published the *Dizionario universale ragionato delli umane cognizioni*, in forty-two volumes (1770-75), with a *supplemento* in six volumes (1775-76); and ten volumes of *Tavoli* (1775-80), in which he had the collaboration of Euler, Dupuis, Lalande, Haller, and others. Among his other works are: *Sul modo di formare la mente ed il cuore dei fanciulli* (1763); *Principii del diritto della natura e delle genti* (1769); *Lezioni di logica* (1770); *Elementi del governo interiore di uno stato* (1781); *Quadro filosofico della religione cristiana*, and *De Newtoniana Attractione, adversus Hambergerum* (1757).

FE′LICIS′SIMUS. The leader of a schism in the Church at Carthage about the middle of the third century. Bishop Cyprian having withdrawn at the outbreak of the Decian persecution, the Church was governed during his absence by the presbyters, among whom was one Novatus, who made Felicissimus his deacon. The records seem to show that Novatus ordained him, regardless of the rule that ordination must be only at the hands of bishops. Felicissimus and his sympathizers objected to the episcopal board of administration, which Cyprian had appointed to visit the Carthaginian Church in his absence; they were displeased with Cyprian himself on account of his retirement from the scene of action; and they were liberal in dealing with the lapsed (weak brethren, who had abjured their faith under pressure of persecution), readmitting them to the Church on easy conditions, which was contrary to Cyprian's express commands. Felicissimus's conduct seemed to warrant his deposition, which Cyprian pronounced as early as A.D. 250. After his return from exile Cyprian convened an important synod at Carthage (251), which excommunicated the offending deacon. Felicissimus, however, had a considerable following. The schismatics completed their organization by the choice of Fortunatus as rival Bishop of Carthage, and Felicissimus visited Rome in the hope of winning sympathy from that important see. His mission was a failure, and Cyprian's vigorous measures of discipline in Carthage, together with the practical agreement as to the treatment of the lapsed, soon reached by Western Christendom, left the schismatics little hope of success. Felicissimus disappears from view, and his movement soon faded out of sight. Some writers find in this schism an effort after presbyterial Church government, as against the episcopal system with which Cyprian's name is so prominently identified. Consult Benson, *Cyprian, His Life, His Times, His Work* (New York, 1897).

FELICITAS, fē-lĭs′ĭ-tăs, SAINT. The name of two reputed Christian female martyrs. The first is said to have been beheaded at Rome, with her seven sons, under Antoninus Pius, about A.D. 150. The second was a slave who, with her mistress, Perpetua, suffered in the amphitheatre at Carthage under Septimius Severus in A.D. 202 or 203. Her day is March 7. The narrative is better attested than that of many of the early martyrdoms. Consult Harris and Gifford, *The Acts of the Martyrdom of Perpetua and Felicitas* (London, 1890); Robinson, *The Passion of Perpetua* (Cambridge, 1891).

FE′LIDÆ (Neo-Lat. nom. pl., from *felis*, cat). The cat family, distinguished primarily by possessing retractile claws. See CAT.

FELISBRAVO, fē′lĭs-brä′vō. A Persian prince in Richard Fanshawe's translation of the Spanish drama by Mendoza, *Querer por solo querer*.

FE′LIX. The name of four popes and an antipope. FELIX I. (Pope, 269-274). His pontificate is interesting as an early example of the relations of the Christian Church to the Roman Empire, and of the recognition by the State of the civil rights of Christians. In the pontificate of Felix's predecessor, Dionysius, Paul of Samosata, Bishop of Antioch, had been deposed by a council held in that city. Paul having resisted the sentence, the matter was laid before Felix, Dionysius being now dead; and, as Paul held possession of the church and church buildings, the bishops were obliged to claim the interference of the Emperor Aurelian, who was passing through Antioch on his return from Palmyra. Aurelian returned a decision to the effect that the buildings should belong to the person "to whom they should be adjudged by the bishops of Italy and Rome." Felix is, perhaps incorrectly, said to have suffered martyrdom in the persecution of the same Emperor, Aurelian, probably in 274. His day is May 30th. Certain letters of a later date have been ascribed to him.—FELIX II. (Pope from 355 to 358). He was chosen to occupy the Roman See after the banishment of Liberius. When the latter returned to Rome in 358, it is said that the Emperor Constantius proposed that Liberius and Felix should exercise jurisdiction jointly; but the Romans rejected the proposal, and Felix had to give way. He retired to his estate on the Aurelian Way, and, according to the *Liber Pontificalis*, died a martyr's death in 365. In the Roman Calendar he appears as saint and martyr, and his day is July 29th.—FELIX III. (Pope from 483 to 492). He was a native of Rome, and of the family from which afterwards sprang Pope Gregory the Great. His pontificate is memorable as presenting the first commencement of the disruption of the Greek and

Roman churches. The contemporary occupant of the See of Constantinople, Acacius, as well as the Imperial Court, were favorers of the Monophysite Party, who refused to accept the decision of the Council of Chalcedon. (See MONOPHYSITES.) By their influence the Patriarch of Alexandria was deposed and replaced by the Monophysite Peter Mongus. The deposed Patriarch having appealed to Rome, Felix sent two legates to Constantinople to require his restoration; and the legates having failed in their trust, and Acacius still adhering to the heterodox party, Felix assembled a council at Rome, and excommunicated not only the offending legates, but also Acacius, the sentence being pinned by a monk upon the back of the Patriarch's robe while he was actually officiating in the church. Felix had previously rejected the *Henoticon*, or decree of union, published by the Emperor Zeno in 482. The schism thus inaugurated (484) was not healed till the year 519. The only literary remains of this pontiff are the letters and other acts of this controversy. He is a saint in the Roman calendar, and his day is February 25th.—FELIX IV. (Pope 526-530). He was a native of Benevento. His pontificate presents no noteworthy event. He is also a saint in the Roman Calendar, and his day is January 30th.—FELIX V. (Antipope from 1439 to 1449). He was Amadeus VIII., Duke of Savoy. He was born in 1383, and succeeded his father, Amadeus VII., as Count of Savoy in 1391. In 1416 Savoy was erected into a duchy. As a ruler Amadeus was mild, just, and successful, and distinguished for his piety. In 1434 he resigned the rule to his son, and retired to the hermitage of Ripaille, on the south bank of Lake Geneva. There he and some companions lived as hermits. He was nominated in the Council of Basel to succeed Eugenius IV. (q.v.) in 1439, and elected on the fifth ballot, although it was objected to him that he had been married and had children, and that he was not an ecclesiastic, and had no knowledge of theology or other fitness for the position. His election was not well received, and he so conspicuously failed to get recognition as Pope from the princes of Europe that he voluntarily resigned after a schismatical reign of ten years. He was then rewarded by being made Cardinal-Bishop of Basel, Lausanne, Constance, and Strassburg, and also Papal Vicar-General for all the States ruled by the House of Savoy. He died January 7, 1451.

FELIX, ANTONIUS. Roman Procurator of Judea in the time of the Apostle Paul. He was a younger brother of Pallas, the favorite of the Emperor Claudius, and, like his brother, evidently a freedman of Antonia, the mother of Claudius. Because of this fact, perhaps, he received the honor, unusual for freedmen, of military command, as well as civic office, and was thrice married into royal connections. He succeeded Cumanus as Procurator of Judea in A.D. 52, and probably held the position till 58, although the latter date is disputed. His rule was marked by ceaseless disturbances and revolts, against which he acted with a severity that finally resulted in his recall to Rome. Most noted among the uprisings was that of the Zealots, his oppression of whom gave rise, or at least new impulse, to the fanatical Sicarii. (See ZEALOT.) The disturbance which occasioned his removal from office was the riot between the Jewish and Syrian inhabitants of Cæsarea, regarding the equality of their political privileges, in the quelling of which Felix being unsuccessful, the consideration of the case was removed to Rome, and Felix was recalled before a decision was given. (See FESTUS.)

It was to Felix that Claudius Lysias, for reasons of safety, sent Paul from Jerusalem after his arrest in that city (A.D. 56), and it was before this procurator that the Apostle's first hearings were held. From these no decision was reached. Paul was remanded to prison, where he was kept, though under lenient regulations, through the remaining two years of Felix's term of service, his trial never being completed. There, also, for the sake of pleasing the Jews, with whom his relations were at that time specially strained, Paul was left by the procurator on his return to Rome. (Acts xxiii. 23-xxiv. 27.) See PAUL.

FELIX, DON. The jealous lover of Violante, the 'secret-keeper,' in Mrs. Centlivre's comedy *The Wonder.* The rôle was a favorite one with Garrick.

FELIX, ELISE RACHEL. See RACHEL.

FELIX, fȧ'lĕ̇ks', EUGEN (1836—). An Austrian painter, born in Vienna. He was a pupil there of Waldmüller, then of Cogniet in Paris, and established his studio in Vienna. His works include "The First Friend," "Interior of a Studio," "Pan and the Bacchantes," and some excellent portraits, notably those of Rubinstein and Duke Philip of Württemberg.

FE'LIX, MARCUS MINUCIUS. A Roman lawyer and Christian, author of *Octavius*, a dialogue in defense of Christianity, probably the oldest Christian work extant in the Latin tongue. Nothing is known of the author. The date of the book is put about 160. It is in Migne, *Patrologia Latina*, iii., and in English translation in the *Ante-Nicene Fathers*, vol. iv. (Buffalo, 1889).

FELIX, SAINT, or, FELIX THE MARTYR. A Christian missionary of the third century. He and Regula, his sister and fellow-sufferer in martyrdom, are said to have been the first preachers of the Gospel at Zurich, Switzerland. They have been the subjects of numerous and often conflicting legends, according to which they were executed by the Governor Decius at the order of the tyrant Maximian. Previous to the Reformation they were venerated as the patrons of the city, on whose seal they continue to occupy a place. Their day is September 11th. Consult *Mittheilungen der antiquarischen Gesellschaft zu Zürich*, vols. i. and ii. (1841).

FELIX HOLT, THE RADICAL. A well-known novel by George Eliot (1866).

FELIX'IANS. A Spanish sect of the latter part of the eighth century, so called from Felix, Bishop of Urgel. See ADOPTIAN CONTROVERSY.

FE'LIXMAR'TE OF HYRCANIA, hēr-kā'nĭ-a. An old Spanish romance, chiefly notable as being among the works with which Don Quixote fostered his idealism before setting forth upon his adventures. The title-character is a valiant knight who slays many giants.

FELIX OF VALOIS, vȧ'lwä' (1127-1212). A co-founder of the Trinitarians (q.v.). He gave his goods to be sold for the poor, and retired to a hermitage near Meaux. In 1198, accompanied by Saint Jean of Matha, he obtained from Pope Innocent III. the right to found the Order of the Trinitarians, which had as an object the redemption of Christian captives from the Moors. Felix was canonized, and his feast is kept on November 20th.

FELL, JOHN (1625-86). An English clergyman and educator, born probably at Longwood (Berkshire). He graduated at Christ Church, Oxford, in 1643, was a zealous Loyalist during the Commonwealth, was appointed canon of Christ Church in 1660, and in the same year became dean. From 1666 to 1668, and during a portion of 1669, he was vice-chancellor of the university. He added several buildings to Christ Church, and greatly improved its scholastic discipline. He also developed the press of the university, and encouraged the collation of manuscripts and other scholarly undertakings. In 1685 he expelled John Locke from Christ Church by command of James II. He became Bishop of Oxford in 1675. His publications include a critical edition (1682) of the works of Cyprian. He was made the subject of a well-known epigram by Tom Brown (q.v.).

FEL'LAH (pl. *Fellahin;* Ar. *fellāḥ*, laborer, from *falaḥa*, to till). One of the agricultural or laboring class of the people of the Nile Valley. In Egypt there was a partial differentiation of the population in early times analogous to that which in India developed into caste (q.v.). This division was perhaps based at least in part on an original diversity or race, and the chief surviving classes are the Bedouin, who are the warlike and wandering people of the deserts, and the Fellahin, who comprise the peaceful and sedentary folk of the annually inundated bottom lands. In general, the Fellahin constitute the peasantry and the Bedouin the soldiery of Egypt; i.e. the distinction is industrial and social rather than ethnic—indeed, there are no constant ethnic differences. As a class the Fellahin are docile and lacking in initiative, but they retain in form and feature the characteristics of their ancestors, the monument-builders of ancient Egypt. The women are especially noted for their comeliness. See EGYPT, under ETHNOLOGY.

FELLATAH. See FULAH.

FELLENBERG, fĕl'len-bĕrk, PHILIP EMANUEL VON (1771-1844). A Swiss agriculturist and educator. He was born in Bern, and was educated at Tübingen. After a sojourn in Paris he settled in Bern, whence he was banished during the French invasion in 1798. Subsequently recalled, he was sent as Ambassador to Paris, where his services largely contributed to ameliorate the political conditions then prevailing in Switzerland. Later in life he devoted himself exclusively to the improvement of the Swiss peasantry; he established an orphan asylum (with Wehrli) in 1804, a colony for poor boys (1816), and other institutions, which together constituted the settlement of Hofwyl (Bern), to which in 1820 a high school for the sons of the middle class and a primary school for children were added. More than two thousand pupils are said to have been taught there. Endeavor was twice made to unite these establishments with those of Pestalozzi; but the two teachers were not sufficiently in harmony. The practical educational influence of Fellenberg upon his native land was, perhaps, even greater than that of Pestalozzi. His literary activity was comparatively unimportant. Consult Hamm, *Fellenbergs Leben und Wirken* (Bern, 1845).

FEL'LING. A town in Durham County, England (Map: England, E 1), three miles southeast of Newcastle, on the North-Eastern Railway. It has manufactures of chemicals and glassware. Population, in 1891, 17,490; in 1901, 22,467.

FELLOW-COMMONER. A term applied to a wealthy or married undergraduate at Cambridge University, who pays extra for the privilege of dining at the 'commons' or fellows' table. At Oxford the term is gentleman commoner, though there the practice is now quite or almost extinct.

FEL'LOWS, Sir CHARLES (1799-1860). An English antiquarian, born at Nottingham. He early showed a fondness for travel, and after 1832 spent a large part of his time in the Levant. In 1838 he began a series of journeys from Smyrna into parts of Asia Minor, at that time almost unknown to Europeans. His chief discoveries were in ancient Lycia, where he ascended the valley of the Patara, finding the ruins of the ancient capital, Xanthus, Thos, and other sites, copying inscriptions, and making drawings of the architecture and sculpture. He then returned to England, and published *A Journal written during an Excursion in Asia Minor, by Charles Fellows* (1838, London, 1839). In 1839 he again visited Lycia, and discovered the ruins of no fewer than thirteen cities, each of which contained works of art. Another journal, entitled *An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor* (London. 1841), was the result of this journey. In 1841 an expedition left England for the purpose of selecting works of art from the ancient cities discovered by Fellows, who accompanied the expedition and directed its operations. Authorized by a firman from the Sultan, they made their selections and returned in the spring of 1842. Another expedition, sent out by the trustees of the British Museum, brought home 27 cases of marbles and casts in 1844. The sculptures, among which are the so-called Harpy and Nereid Monuments from Xanthus, are now exhibited in the Lycian Room of the British Museum. In 1845 Fellows's labors were rewarded by the honor of knighthood. His other works are: *The Xanthian Marbles: Their Acquisition and Transmission to England* (1843); *An Account of the Ionic Trophy Monument Excavated at Xanthus* (1848); a reissue of his earlier journals under the title of *Travels and Researches in Asia Minor, Particularly in the Province of Lycia* (1852); and *Coins of Ancient Lycia Before the Reign of Alexander: with an Essay on the Relative Dates of the Lycian Monuments in the British Museum* (1855).

FELLOW-SERVANTS. A term used in the rule governing employers' liability to designate those who are employed by a common master in the promotion of a common enterprise, and whose relations are such as to make the safety of any one depend, in the ordinary and natural course of things, on the care and skill of the others. Accordingly an engine-driver is a fellow-servant of a switchman when they are serving a common employer in conducting a common business; while the seamen of one ocean steamer are not fellow-servants of those of another steamer, although the vessels are owned by the same person. In the latter case the relations of the two crews are not such as to render the safety of one dependent, in the natural and ordinary course of things, upon the care and skill of the other.

Although the definition of fellow-servant stated above is sustained by the English decisions, by those of our Federal courts, and by those of the great majority of our State tribunals, it has been rejected in a few jurisdictions. There the view has prevailed that the employees of a common master are not to be deemed fellow-servants within the rule relating to employers' liability unless they are of equal rank. In these jurisdictions the conductor of a railway train, accordingly, is not the fellow-servant of a brakeman; nor is the superintendent of a mill, nor the foreman of a gang of laborers, a fellow-servant of those who are subject to his control. If a subordinate is injured through the negligence of his superior, the master is liable for such injury.

In the other class of jurisdictions the master is not liable unless the act is one which he is under an absolute legal duty to perform properly. This legal duty binds the employer to provide for his employees a safe place to work; to provide safe machinery and appliances; to formulate suitable rules and regulations for the safe conduct of his business, if such rules are needed; to warn his employees of danger which they could not or would not ordinarily discover; and to provide suitable superintendents and colaborers. If he delegates either of these duties to an employee, no matter what his grade or rank, the negligence or misconduct of the employee in the performance of that duty is in law the negligence or misconduct of the employer. For it he is liable to the injured servant. Perhaps it should be added that the negligent servant is liable to the person injured by his negligence, whether the latter is a fellow-servant or not.

Consult: McKinney, *Treatise on the Law of Fellow-Servants* (Northport, 1890); Bailey, *The Law of Master's Liability for Injuries to Servants* (Saint Paul, 1894).

FELLOWSHIP (from *fellow*, Icel. *fēlagi*, from *fēlag*, partnership, from *fē*, property, Eng. *fee* + *lag*, a laying together, AS. *lagu*, Eng. *law* + Eng. *-ship;* cf. Icel. *fēlagsskapr*, fellowship). An institution which arose in connection with the mediæval colleges, originally eleemosynary in their character. The members, or 'fellows' (*socii*), as they are called, usually had a boarding-place in common, and received regular stipends provided for out of the income of the foundation. Such a college was established at the University of Bologna as early as 1267, and the beginning of the institution at the University of Paris is traced to a permanent though humble provision for sleeping accommodations, and for small stipends to be given to eighteen scholar-clerks, the founder being a pious man, one Dominus Jocius of London. At Oxford a foundation was in 1243 established for two priests, who, while pursuing their studies, should say mass for the soul of their benefactor. In 1249 University College was founded with an income for the support of ten or more masters of arts, who were studying theology. At Cambridge, Saint Peter's College was founded in 1284. The recipients of these benefactions were usually required to pass certain examinations, or to have attained a certain standard, and often to show their need of such support. Frequently, however, the founder retained the patronage, which was restricted to his kin, or to the members of a certain diocese or district. By the University Act of 1854 such restrictions were removed in England. At present the fellowships there are ordinarily confined to the graduates of the university to which the college belongs.

At Bologna the College of Spain still survives, having five or six students. The great Parisian endowments disappeared as a result of wars and revolutions. A fellowship in the Sorbonne is now merely an honorary distinction. In England the fellowships have steadily increased in number and value. To-day their income ranges from less than £100 to £800 annually; but since they depend upon the proceeds of landed property, this sum varies from year to year. To this is added the privilege of occupying certain apartments, and in some cases of enjoying perquisites in meals or commons. Many English fellowships are tenable for life, others for seven years, and at Cambridge for even shorter periods. In general they are forfeited should the holder attain to certain preferments in the Church or at the bar, and sometimes in the case of his succeeding to property above a certain amount. Except by special vote of the college, the holder of a fellowship forfeits it by marriage. The English fellows usually carry on instruction in their own colleges, and are frequently professors in the university as well, or hold other academic positions.

In the colleges and universities of the United States the term 'fellow' often means trustee, as, in one sense, at Harvard. On the other hand, the ordinary fellowship is an honor bearing with it a certain annual stipend, which varies from $120 to $1000. The average amount is, however, about $500. The fellowships are bestowed according to merit, and usually without restriction as to the collegiate institution of which the candidate is a graduate. The holder is expected to pursue graduate work in some special department to which the fellowship is attached, and in most cases this work is to be done at the institution which grants it. Occasionally, however, the fellow is allowed or even required to travel. Some institutions require certain services in connection with instruction from the holders of fellowships, others expect their time to be devoted to study. There were in 1900 at Harvard 30 fellowships, at Yale 24, at Columbia 29, at Cornell 24, at Johns Hopkins 22, at Chicago 30, at Princeton 12, at Pennsylvania 31, and at Bryn Mawr 14, three of which provide for a sojourn in Europe. Other institutions offer in all 55 fellowships. For the current status of fellowships in various institutions, consult: *The Handbook of Graduate Clubs* (Chicago); *College Year-Book* (New York, 1896 et seq.); and the *Minerva Jahrbuch der Gelehrten Welt* (Strassburg, 1892 et seq.). See UNIVERSITY.

FELL′THAM, OWEN (c.1602-68). An English author. He was born in Suffolk, and was connected with the household of the Earl of Thomond, at Great Billing, Northamptonshire. His name has survived in literature as the author of a thoughtful and agreeable series of moral essays entitled *Resolves*, written "to hold himself and others within the limits of prudence, honor, and virtue" (1st ed. 100 essays, c.1620: 2d ed. 200 essays, 1628; 4th ed. 1631, reprinted by W. Pickering, London, 1846). He also wrote *A Brief Character of the Low Countries* (1652), which was incorporated with the eighth edition of the *Resolves*.

FELO DE SE (ML., traitor to himself). In criminal law, the technical description for a self-murderer, a suicide. As defined by Blackstone, "A *felo de se*, therefore, is he that deliberately puts an end to his own existence, or commits any unlawful act, the consequence of which is his own death" (*Comm.* iv. 189). For the legal consequence of self-murder, see SUICIDE.

FELON (OF. *felon, felun, fellon*, Fr. *felon*, ML. *felo, fello*, wicked man, from OF. *fel*, It. *fello*, wicked, from Gael. *feallan*, Bret. *falloni*, treachery, Ir. *feal*, evil; connected with Lat. *fallere*, to deceive, Gk. *σφάλλειν*, *sphallein*, to fall, Skt. *phal*, to deceive, OHG. *fallan*, Ger. *fallen*, Icel. *valla*, AS. *feallan*, Eng. *fall*), or PARONYCHIA. A whitlow; properly, a painful inflammation (generally suppurative) around the nail, or at the matrix, or root, of the nail. Commonly, however, the term is applied to a suppurative circumscribed inflammation anywhere on the fingers or hand. If superficial, the inflammatory process may undermine the epidermis only; if deep, it may burrow under the sheath of a tendon or under the periosteum. Pathologically, felon is a cellulitis, and it is due in people of reduced resistive power to an injury, such as a puncture, cut, or scratch, followed by infection of the wound with pus germs. Pain is a prominent symptom, with tenderness on pressure, heat, throbbing, and much tension. If amelioration does not appear before pus is present, under treatment with rest, elevation, and applications of hot water compresses, incisions must be made so as to release the exudate. Pus generally appears in forty-eight hours after infection. The incisions must generally be deep, and occasionally multiple. A joint of the finger has been lost through delay after pus has appeared. To avoid contraction and stiffness as the cicatrix forms, the finger or hand must in some cases be supported on a splint.

FELONY. In the common-law classification of crimes, the second in atrocity and in importance, the first being *treason*, and the one comprehending all minor offenses being *misdemeanors*. Omitting treason (which, though sometimes classed as a felony, really stands by itself in our legal system), the distinction between felonies and misdemeanors corresponds roughly to that between grave offenses and such as are less heinous in character. But the distinction is a purely artificial one. Our law has never made a classification of crimes which was based on their inherent nature, but has had reference in its divisions rather to the kind of punishment inflicted. A felony was any crime punishable by forfeiture of the criminal's lands, or goods, or both. Blackstone adds that capital or other punishment might be superadded to the forfeiture, according to the degree of guilt, and in England, for a long time, most felonies were punishable by death. But at common law forfeiture was always an essential part of the penalty, and punishment by death was never the true criterion. In England important statutory changes in the laws as to forfeiture (33 and 34 Vict., c. 23, 1870) have taken away the practical utility of the former test of a felony. But those crimes are still held to be felonies and misdemeanors respectively which were so when the test was operative. Many crimes have been expressly declared felonies by the statutes creating them. Even in the absence of such declaration all crimes for which by statute judgment of life or limb may be decreed are there held to be felonies. In some of the United States the distinction between felonies and misdemeanors is practically discarded, the punishment for each particular crime being prescribed by statute, and the word felony, if used at all, being employed in a loose and indefinite sense. In other States the distinction is retained by statute and made to depend on the kind of punishment. Thus, in a considerable number, statutes have declared that crimes punishable by death or by imprisonment in the State prison shall be felonious. In those States it is sufficient to constitute felony that those penalties *may* be imposed, though the court or jury may be given power to inflict a less severe punishment. See CRIME; INFAMOUS CRIME.

FELSING, fĕl′zĭng, GEORG JAKOB (1802-83). A German engraver, born at Darmstadt. He studied under his father, Johann Konrad Felsing, and under Giuseppe Longhi at the Academy of Milan. He was noted for the accuracy with which he produced the peculiar characteristics of paintings which he engraved, particularly those of the Düsseldorf school of German art. Among his finest engravings may be mentioned: Correggio's "Marriage of Saint Catharine"; Carlo Dolci's "Christ on the Mount of Olives;" Raphael's "Violin Player;" Overbeck's "Holy Family;" "Salvator Mundi" (after da Vinci); "Hagar and Ishmael" (after Köhler); "Jeremiah on the Ruins of Jerusalem" (after Bendemann); and "Christ Taken Prisoner" (after Hofmann).

FELSITE (from Ger. *Fels*, rock). A term now little used, but one which formerly was the equivalent of quartz porphyry (now likewise obsolescent). Rocks formerly described as felsites would now fall within the greater class of rhyolites (q.v.). By German petrographers felsite is used to describe an ancient rhyolite, which contains few if any porphyritic crystals or phenocrysts.

FELT (OHG. *filz*, Ger. *Filz*, OChurch Slav. *plŭsti*, felt; probably connected with OHG. *falz*, Ger. *Falz*, fold). A fabric formed without weaving by taking advantage of the natural tendency of the fibres of hair and wool to interlace with and cling to each other. As to the origin of the knowledge of felt-making, its beginnings antedate by many centuries the Christian Era, and the fabric is mentioned by the earliest writers. On account of the greater simplicity of its structure, it is probable that it was made long before the art of producing cloth by spinning and weaving had been discovered.

The felting quality of fibres of hair or wool results from their structure. When examined by the microscope the hair of all animals is found to be more or less jagged or notched on its surface; in some animals it is distinctly barbed; and this structure is so directed that the teeth or barbs all point toward the tip of the hair. If a piece of human hair (in which this structure is less marked than in most animals) be held between the finger and thumb, and rubbed in the direction of its length, it will invariably move between the fingers in the direction of its root; for the skin, while moving toward the tip of the hair, slides freely upon it, but moving in the other direction, against the inclination of the barbs, it brings the hair with it. It will be easily understood that when a number of hairs are pressed together those which lie in opposite directions to each other and in contact will interlock at these barbs or teeth, and thus resist any effort to tear them asunder. When once this close contact and interlocking is established between any two or more hairs, they remain attached, but the others that are differently arranged, or not in contact, will still be free to move upon each other; and therefore, if subjected to continual blows, pushing, and pressure, the unattached hairs will be continually shifting until they reach others in suitable positions for clinging together, either by crossing obliquely or by lying in the same line, and overlapping at their ends or any other portion. When the hair has a natural tendency to curl the felting is still more readily brought about by the additional interlacing. Although the felting property is possessed in a preëminent degree by wool, it belongs to the hair or fur of other animals, including the goat, ox, hare, rabbit, musquash, and beaver.

The first mechanical process for the production of felt was invented by Mr. J. R. Williams, an American, about 1820. Many patents have since been taken out for the various details of felting machinery, but the main principle is the same in all. The wool is carded more or less perfectly into laps of the length and breadth of the web to be made. One layer of these laps is placed upon another to secure the desired thickness of the fabric, and the two outside layers are often of a finer quality than the interior. The bulky sheet is now passed between rollers which are partly immersed in water, and some of them are heated internally with steam. The material is subjected to a beating and oscillatory motion, as well as to pressure. The completed fabric is dyed and finished like ordinary cloth. The details of manufacture are, at least in America, strictly guarded trade secrets, each factory having its own processes and specially made machinery.

Felt is used for a very great variety of purposes. It is employed as a covering for floors and as an upholsterer's material. It is made up not only into hats, but into cloaks and other garments. Carriage linings, polishing cloths, pianoforte hammers, and many other objects requiring a soft, thick cloth are made from felt. The felt used for women's hats is cut from the piece, but that employed in the manufacture of men's hats is made in special shapes as a part of the hatter's trade. The material used for men's hats is usually the fur of raccoons, beavers, or rabbits, mixed with some good felting wool. See HATS.

Various fabrics which are technically known as felt, and which possess in greater or less degree the qualities of this material, are manufactured for use in different industries. In these coarser grades of felt cow's hair is often an important ingredient. The felted sheathing used as a nonconducting covering for retaining the heat of steam boilers is a substance intermediate between felt and paper. It is made from woolen refuse and other cheap materials reduced to pulp, beaten and dried. *Lining* and *roofing felts* are used in the construction of buildings, and act as nonconductors of heat, and sometimes of moisture and sound. They usually consist of an agglutination of animal fibres mixed with tar or asphalt. The *asbestos lining* and *roofing felt* is made of pure asbestos, saturated with asphalt, the body fibre in certain brands containing no organic matter. The process of manufacture is similar to that employed in making paper. *Papermaker's felt* is not a true felt at all, but a coarse, loosely woven material which has been neither teazled nor spun. No detailed information regarding the manufacture of felt appears to be available in printed form, and such references as can be found are scanty and, for the most part, written long ago. This is attributed to the closeness with which the processes of manufacture are guarded.

STATISTICS. According to the Twelfth Census of the United States, there were in the country 36 establishments devoted to the manufacture of felt goods, including an invested capital of $9,125,276, and producing goods valued at $6,461,691. The principal products were felt cloths, boot and shoe linings, upholstery felts, trimmings and lining felts, felt skirts, and endless belts for paper manufacture.

FELT, JOSEPH BARLOW (1789-1869). An American antiquarian. He was born at Salem, Mass., and graduated at Dartmouth in 1813. After holding pastorates in the Congregationalist Church at Sharon, Mass. (1821-24), and Hamilton, Mass. (1825-34), he was commissioned by Gov. Edward Everett in 1836 to arrange the Colonial and early State papers of Massachusetts. At this work he continued for ten years. He was librarian of the Massachusetts Historical Society (1842-58), president of the New England Historic-Genealogical Society (1850-53), and recording secretary of the American Statistical Association (1839-59). He was the author of the following works on New England history: *Annals of Salem* (2d ed. 2 vols., 1845-49); *History of Ipswich, Essex, and Hamilton* (1833); *Historical Accounts of Massachusetts Currency* (1839); *The Customs of New England* (1853); *Ecclesiastical History of New England* (2 vols., 1855-62); and several other genealogical and biographical works.

FEL'TON, CORNELIUS CONWAY (1807-62). An American classical scholar, born at West Newburg, Mass. He graduated at Harvard in 1827, and taught first at Geneseo, N. Y., 1827-29. In the latter year he was appointed tutor in Latin at Harvard; in 1830, tutor in Greek; in 1832 he became university professor, and two years later Eliot professor of Greek; in February, 1860, he was made president. Among his publications were: *Homer: with English Notes and Flaxman's Illustrations* (1833); *Munzel's German Literature* (1840); *Clouds and Birds of Aristophanes; Ancient Literature and Art; Poets and Poetry of Europe; Panegyrics of Isocrates; the Agamemnon of Æschylus: Classical Studies* (1843); and *Guyot's Earth and Mars* (1849). In 1853-54 he made a European tour; and in 1855 he revised for publication Smith's *History of Greece*, with an edition of Lord Carlisle's *Diary in Turkish and Greek Waters*. A selection from modern Greek writers was published by him in 1856. Other works of his were: "Life of General Eaton," in Spark's *American Biography; Addresses;* and contributions to the *North American Review*. He was a member of the Massachusetts Board of Education, regent of the Smithsonian Institution, a member of the American Academy of Arts and Sciences, and a corresponding member of the Archæological Society of Athens. Consult *Proceedings of the Massachusetts Historical Society* (Boston, 1866).

FELTON, John (c.1595-1628). The assassin of the Duke of Buckingham, the favorite of Charles I. He was descended from an old Suffolk family, and entered the army at an early age. Of a sullen and churlish disposition, he was generally disliked, and his applications for promotion were disregarded. He felt that he had a special grievance against Buckingham, who had personally refused his petitions, and after reading the declaration of the House of Commons that the Duke was a public enemy, he stabbed him, at Portsmouth, August 23, 1628. The crime was popular with the army and navy and with the people of England generally, numerous poems and songs being written in Felton's praise. He was tried on November 27th, and hanged at Tyburn the next day.

FELTRE, fĕl′trȧ (Lat. *Feltria*). A city in the Province of Belluno, Italy, 850 feet above the sea, near the Piave, 34 miles northwest of Venice (Map: Italy, F 2). The bishopric was united in 1819 to that of Belluno. Feltre has a beautiful cathedral, a seminary, a gymnasium, a hospital, an orphan asylum, and a municipal pawnshop, established in the fifteenth century. It is a market for silk, wine, and oil, and spins silk and bleaches wax. In 1809 Napoleon gave Marshal Clarke the title of Duke of Feltre. To Pamfilo Castaldi, as the discoverer of the art of printing, and as a native of the town, a monument was erected in Feltre in 1868. Population, in 1901 (commune), 15,243.

FELTRE (OF., from OHG. *filz*, Ger. *Filz*, AS., Eng. *felt*). An ancient kind of cuirass made of wool, thickly padded, to resist the blow of a sword.

FELTRE, fĕl′trȧ, Morto da. See Morto da Feltre.

FELUC′CA (It., from Ar. *falūka, fulk*, ship, from *falaka*, to be round). A small, fast-sailing vessel formerly much used in the Mediterranean, and still common there as a coasting or fishing vessel. It has usually two masts, each carrying a lateen sail, and is also fitted with eight to sixteen oars. Feluccas are not ordinarily decked over, but a small shelter is sometimes built aft.

FEMALE QUIXOTE, The. A satirical romance by Charlotte Lennox (1752), written in ridicule of the artificial fiction of Gomberville and Scudéry. The heroine is Arabella, whose head is turned by reading romantic tales. Its dedication, written by Johnson, was addressed to the Earl of Middlesex. Later editions appeared in 1783 and 1810.

FEME COVERTE, fĕm, *or* făm, kŭv′ẽrt (AF., protected woman). The common-law term for a married woman, having reference to her legal status. The corresponding status of an unmarried woman was indicated by her legal description as a *feme sole*. When the *feme sole* married she was said to be under *coverture*, which signified that her legal personality had for many purposes become merged in that of her husband. These terms have lost their significance in those jurisdictions in which married women have been invested with the full legal rights and responsibilities of unmarried women. The legal status of the *feme coverte* will be considered under the title Husband and Wife. See also Marriage; and Woman.

FEMERN, fā′mĕrn, or **FEHMARN.** An island in the Baltic Sea, belonging to the German Province of Schleswig-Holstein, separated from Holstein by a strait called the Femern Sound, and from Laaland on the north by Femern Belt (Map: Prussia, D 1). It has an area of 71 square miles. The surface of the island is flat, and but sparsely wooded; the soil is fruitful. Agriculture, stock-raising, fisheries, and the making of stockings for exportation form the principal employments of the inhabitants. Femern has a population of about 10,000. The chief towns are Burg and Petersdorf. The island was transferred from Denmark to Prussia in 1866.

FEMMES SAVANTES, fȧm sȧ′väNt′, Les (Fr., The Learned Women). A comedy by Molière (1672), adapted from *Les Précieuses Ridicules.* It is a satire on feminine pedantry.

FE′MUR (Lat., thigh). The thigh-bone. In general terms, it consists of a shaft, very slightly curved, and two extremities. The upper extremity bears two projections, called the greater and lesser *trochanters,* for the attachment of muscles, and a short *neck,* nearly at right angles to the shaft, terminated by a hemispherical *head,* which, being received into a cavity of the pelvis called the acetabulum, forms the hip-joint—a ball-and-socket joint. The lower extremity of the femur has on each side an enlargement called a *condyle*, or knuckle. The articular surface of the condyles is hemicylindrical, as also is the somewhat depressed space between them, called the *trochela*, and with the large bone of the leg, called the tibia, forms the hip-joint—a hinge joint. The femur is attached to the pelvis by two ligaments—a capsular ligament, which incloses the head and neck, and the *ligamentum teres*, a sharp ligament which joins the head with the bottom of the acetabulum. It is attached to the tibia by several ligaments, placed in different positions, to combine strength with freedom of motion, the most important of which are the lateral ligaments and the crucial ligaments. The crucial ligaments cross from one member of the joint to the other in oblique directions. Powerful extensor and flexor muscles, besides performing their ordinary functions, aid in keeping the parts in opposition. The femur has a wide range of distribution in the animal kingdom, and is not the exclusive property of warm-blooded animals. In man it is the strongest, longest, and largest bone. In the whale it is only rudimentary. In fishes it is not represented; but has a varying importance in mammals, birds, reptiles, and amphibians. It is a short bone in the ruminants and the horse family. In the tortoises the curve is considerable, while it is almost straight in carnivora, bats, etc. In many reptiles it is slightly rudimentary. For illustrations, see Skeleton.

FEMUR, Comparative Anatomy of. Although certain comparative anatomists have attempted to find in the metopterygium of the fin of a fish a homologue of the femur, it is beyond question that such a bone is not actually found below the more or less terrestrial amphibians. In the short-legged members of that class (Urodela) the femur is a short and relatively unimportant bone; but in those forms whose chief mode of progression is by leaping (Anura), it becomes the longest and most important bone of the hind limb. Among reptiles we find the femur, when present, a short but very stout bone, reaching its strongest development among the Crocodilia, though the lizards and turtles are not far behind. Among snakes, a femur is present only in the families Tortricidæ and Pythonidæ, and in those cases it is greatly aborted. The femur is sometimes lacking in lizards, and in other cases is rudimentary. Among birds the femur is a short, stout bone imbedded in muscles and concealed beneath the skin; its upper, articular end is rounded and almost at a right angle with the main shaft; the terminal condyles are large and on the outer is a ridge which plays between the heads of tibia and fibula. Most mammals possess a well-developed femur, the relative length of which depends very largely upon the habits of the animal and the proportions existing between the fore and hind limbs. No femur is present in the manatee or the dugong, and it is wanting also in most of the Cetacea. In some whales, however, which possess a rudimentary pelvic girdle, a small bone lying just outside the latter is thought to represent the femur. Monkeys possess femurs most nearly like that of man, and this is especially true of the anthropoid apes; yet even the gorilla, which in this respect is the most man-like of all the apes, has certain peculiarities of the femur by which the expert can distinguish it from man. These differences between the femurs of apes and man are so readily recognized that when the famous remains of *Pithecanthropus erectus* were found in Java by Dubois, their position, intermediate between man, whom they approach in cranial character, and apes, was determined by the examination of the femur, this bone showing certain pithecoid characters quite strongly.

FEMYNYE, fĕm'ĭ-nē', or **FEMINEE**. A name used by Gower and Chaucer for the Kingdom of the Amazons.

FENCE (by aphæresis for *defence, defense*, from Lat. *defendere*, to ward off, from *de*, down + *fendere*, to strike; connected with Gk. *θείνειν*, *theinein*, to strike). In agriculture, a barrier, more commonly constructed of stones, rails, planks, pickets, or wire, used to inclose some space or to separate it from an adjoining area. Fences are primarily intended to confine farm animals to a definite area, or to prevent those of one farmer trespassing on the premises of his neighbors.

Legal Aspect. Fence laws are quite generally in force in the United States, but their requirements are very variable. In some cases they require each person to fence in his own stock, but not to fence out the stock of others. In other cases the reverse is true, especially in sparsely settled regions, where the amount of unoccupied land is so much larger than the occupied area, and the grazing system prevails. Great legal diversity also obtains in different States regarding division fences, highway and railway fences, and what in a legal sense constitutes a fence. Martin states that "in Maine, New Hampshire, Massachusetts, and many other States, it is provided that all fences four feet high, and in good repair, consisting of rails, timber, boards, or stone walls, and all brooks, rivers, ponds, creeks, ditches, hedges, and other things deemed by the fence viewers to be equivalent thereto, shall be accounted legal and sufficient fences. In Vermont, Connecticut, Michigan, and some other States, a legal fence must be 4½ feet high. In Missouri post fences must be 4½ feet high, hedges 4 feet nigh, turf fences 4 feet high, with ditches on each side 3 feet deep in the middle and 3 feet wide; worm fences must be 5½ feet high to the top of the rider, or, if not ridered, 5 feet to the top of the top rail, and must be locked with strong rails, poles, or stakes; stone or brick fences must be 4½ feet high. In New York the electors of each town may by vote decide for themselves how fences shall be made and what shall be deemed sufficient."

Necessity. Fencing is more general in the United States than in European countries. It has been stated that the farm fences of the United States cost more than the farm buildings. Much fencing is undoubtedly done that is useless, expensive, and unsightly. Many fences, like the zigzag fence and the stone fence, take up much valuable land that might otherwise be profitably cultivated; they harbor weeds, insects, etc., and frequently disfigure the landscape. As may be inferred from what is stated above, the extent to which fencing is necessary depends mainly upon the laws in force. Where every owner of stock is liable for the damage done by them, the fencing may be limited to that required to keep the stock confined on his own premises. Still, even in this case many prefer completely to fence their premises rather than be annoyed by the unpleasant consequences of depredations of a careless neighbor's stock. However, it may be laid down as a general rule that from both esthetic and economical considerations only such fences should be maintained on a farm as are absolutely necessary.

Rail Fences. When timber is abundant, as it is in the early days of the settlement of well-timbered regions, the zigzag, worm, or Virginia rail fence is commonly used. Such a fence properly built, of good timber, is durable and effective, but is wasteful of land and timber, and is expensive when the supply of the latter becomes limited. It is then often replaced by other cheaper forms of pole, brush, or wicker fences, or by the neater and more substantial board fences.

Stone Fences. In regions where stones abound, fences have been built to serve the double purpose of a fence and of a place of deposit for surplus stones. They are substantial, but expensive, on account of the labor required in their construction, and often wasteful of land, because they too frequently become merely long piles of stones around the fields.

Sod Fences. Where both timber and stones are lacking, sod has been successfully employed in the construction of fences. At best, sod fences are makeshifts.

Hedges. In England and other European countries hedges are employed in place of fences to a much greater extent than in the United States. The objections to them are that they are slow of growth, expensive to keep in order, that they 'draw' the adjacent land, harbor weeds, insects, etc., and throw a considerable amount of land out of cultivation. There are many cases, however, in which the hedge proves both useful and ornamental. The favorite hedge plant in England is the hawthorn. In the Middle and Southern United States the osage orange is probably most commonly used. The arbor vitæ and the boxwood (for evergreen hedges) and the honey locust are also frequently used. When used as fences, hedges are frequently planted on embankments of ditches or double ditches.

The Picket Fence. This form of fence is used especially for inclosing yards and gardens. It may be constructed of cheap split pickets, or of the very ornamental and expensive kind, the variety of styles being almost infinite. The picket fence forms an especially effective barrier for small animals. It may be constructed entirely of wood, of wire and wood, or of iron.

Wire Fences. Post and wire fences are probably more extensively used than are any other kind, especially in regions where timber is scarce. The single wire does not resist changes of temperature, and is not as strong as the twisted wire. Firmly twisted steel wire, with barbs at short intervals, is the kind most widely used. The barb-wire fence takes up little space, is not destroyed by fire, is easily repaired, and is readily adapted to inequalities of surface. It may also be so constructed as to form an effective barrier to stock and trespassers of all kinds. The principal objection urged against it is its liability to injure stock. For this reason it is better suited to large areas than to small inclosures in which animals are likely to be more or less crowded. Various means have been proposed for overcoming this danger, but with only partial success. Two-strand twisted wire, with two-pointed and four-pointed barbs, are used, as well as flat and twisted, barbed and unbarbed, flat steel straps. The barbs should be just long enough to repel infringing animals, without inflicting serious injury. Various implements have been devised which greatly facilitate the construction of wire fences. It is generally considered that two strands of barb wire, 22 inches apart, the lower 22 inches from the ground, will turn horses, cattle, and young stock, and one strand is sometimes used as a temporary barrier for the larger stock. A fence of three strands, 12, 23, and 42 inches from the ground, is more effective than a two-strand fence. Four-strand fences, with the strands 5, 12, 22, and 48 inches from the ground, are commonly used, with or without a baseboard close to the ground. Five strands, it is claimed, will turn dogs, pigs, poultry, and other small animals. With embankments, fewer strands are required for an effective fence. It is common to use posts 8 feet apart, as in board fences, but fewer posts are frequently made to serve. The corner posts should be securely braced, in order that the wires may be tightly stretched.

Flood-Fences. Across streams subject to floods, or sloughs too wide for flood-gates (see below), fences are often a necessity. These are usually constructed in panels, on logs, which are linked together and fastened to posts on the banks with iron couplings, so that the fence rises and falls with the flood.

Hurdles, or Portable Fences. These are often useful. They may be constructed of wood or of wire, in a variety of ways, depending upon the purpose for which they are to be used.

Gates have generally replaced the more primitive bars, being more sightly and convenient. When properly made of well-seasoned lumber or of metal, they are very durable. The styles of construction are almost infinite. Gates for roadways should be at least 14 feet wide, and should be well braced so that they will not sag. The styles of hinges and especially of fastenings, are almost as numerous as the kinds of gates. (See also Gateways.) When fences cross streams or gulleys subject to flood, it is necessary to employ flood-gates, which are panels of fence suspended on hinges so that they yield to the force of the flood and resume their position when it subsides.

Posts. The best timber for posts is probably supplied by red cedar, yellow locust, black walnut, white oak, and chestnut. Timber for posts should be cut when the sap is dormant—e.g. in midwinter or in August. The bark should be removed before setting the posts. Various means of preserving posts have been proposed. Soaking the part to be placed in the ground in kerosene and afterwards coating with coal-tar has been found effective. Soaking in blue vitriol (1 pound of vitriol to 40 of water) and in creosote and charring have also been recommended.

It may be laid down as a general rule that fences should be built only when absolutely necessary, and then substantially constructed of good material, since a good fence will prove more economical in the end than a poor one.

FENCE, FENCING (in law). At common law, a landowner is under no duty to maintain a fence, either to mark his boundary line, or to protect his premises from trespass by man or beast. On the other hand, every one is under a common-law duty to keep his cattle from trespassing upon the land of others. Accordingly the introduction of fences, in agricultural regions at least, appears to have been for the purpose of keeping cattle in, rather than of shutting them out. They were resorted to as a convenience rather than a protection.

While the common law does not confer upon a landowner the right to force his neighbor to maintain a fence, it does permit him to acquire such a right by agreement or prescription. When the right is so obtained it is called an easement, and the land, whose owner is thus bound to maintain a fence, is said to be subject to a servitude. A contract under seal by a property-owner with his neighbor to build and maintain a fence upon the land of the former for the protection of the neighbor's premises, not only creates a personal liability enforceable against the promissor, but it may, if so intended, create an incumbrance upon his land in the nature of an easement. A prescriptive liability of this character is not common, nor is it easily established. One who claims it must be prepared to show not only that the person charged has uniformly repaired the fence in question, but also that he has so repaired it at the request of the claimant, and in recognition of the latter's right.

In some of our States the common-law rule that landowners are not bound to fence against trespassing cattle has been rejected by the courts, as unsuited to the conditions and usages of a new country; and the rule has been adopted that the owners of cultivated lands can recover for damages done thereto by trespassing cattle only when they are inclosed by good and sufficient fences. This rule has been recognized by the United States Supreme Court as applicable to the public lands of the Federal Government. In all of the States, and in England, the common-law doctrine has been modified by statute. It is impossible here to describe this legislation in detail, but its characteristic features are these: First, it imposes upon adjoining landowners the duty of contributing equally toward the erection and maintenance of division fences between the improved or cultivated portions of their lands. Second, these fences are to be so built that the line between the two estates shall pass through the middle. At common law, the owner, who was bound to maintain a division fence, was obliged to construct it wholly upon his premises. Third, what constitutes a lawful fence is generally fixed by the terms of the statute, or is left for definition to local authorities. In England barbed-wire fences along highways are prohibited; but in this country their use is permitted. Fourth, division fences are intended, under modern legislation, as a protection against cattle rightfully on adjoining land, and only against those. In some cases, however, the statutory duty to fence is an absolute one. Such, as a rule, is the duty of railroad companies. Until they erect, and unless they maintain the statutory fences, they are liable to all damages inflicted by their engines and cars upon cattle straying upon their tracks. They may even be liable to passengers and employees who are injured in collisions with trespassing cattle. The private property-owner, however, owes a duty of fencing only to his immediate neighbor. If his fence conforms to statutory requirements, he is not liable to his adjoining neighbor for the trespasses of his cattle upon the latter's land, unless they are unruly beasts. On the other hand, he cannot recover for the trespasses of his neighbor's cattle if his own fences are defective. A fence is a part of the land. This is true even of a rail fence, although no stakes are set into the ground. The same doctrine has been applied to fencing materials which are temporarily detached from the soil when there was no intention of diverting them from their original use. They are real estate, not chattels. See Hunt, *Law of Boundaries and Fences* (London, 1896); Thompson, *Law of the Farm* (San Francisco, 1896); id., *Law of Boundaries and Fences* (Albany, 1874); Thornton, *Railroad Fences, and Private Crossings* (Indianapolis, 1892).

FENCE-LIZARD. A small, active, and harmless iguanid lizard (*Sceloporus undulatus*), common throughout all the warmer parts of the United States and Mexico. It is exceedingly variable in color, but Eastern specimens are usually brown-green above and whitish below, with an indistinct stripe on each side, above which is a double series of narrow undulating V's, pointing forward. The males have a black mark diverging from the chin to each shoulder, and other blue and black patches and marks on the under surface which are lacking in the females. Texas and Sonoran examples form the paler variety *consobrinus*, and a Rocky Mountain variety (*tristichus*) is distinguished by its green color and eight cross-bands.

This little animal is exceedingly active, running swiftly, dodging about tree-trunks with incredible agility, and hiding beneath loose bark, etc., for repose and safety. It climbs trees to some extent, but keeps mainly near the ground, darting along fences and prostrate logs in pursuit of insects or in fear of hawks and similar enemies. De Kay states that it has some power of changing its colors, and that when irritated it elevates its spinous scales, and bristles into a formidable appearance; it is, however, entirely harmless, and makes an amusing pet. It multiplies by eggs laid in dry earth, probably in little groups, in early summer. "The eggs are long and narrow, are covered with a tough coat . . . and are abandoned to their fate, but when the young are hatched they are treated with the utmost gentleness by all the adults." For systematic facts, consult Cope, *Crocodilians, Lizards, and Snakes* (Washington, 1900); for breeding habits, Hay, *Batrachians and Reptiles . . . of Indiana* (Indianapolis, 1893); also popular accounts in the books of De Kay, Abbott, Sharp, and similar writers.

FEN'CHURCH, The Cripple of. The courageous cripple in Heywood's comedy *The Fair Maid of the Exchange.* The heroine is in love with him, but he resigns her to a younger and handsomer lover.

FENCIBLE. A term formerly applied to bodies of militia, yeomanry, or volunteers in Great Britain. They were enlisted entirely for local defense. The name is now practically obsolete except as a designation of a few historic corps.

FENCING. Specifically, the art of attack and defense with sword or rapier, but frequently employed so as to include the use of such weapons as foils, singlesticks, broadsword, quarter-staff, bayonet, lance, etc. It has also been well defined as the philosophy of gymnastics. There is not much evidence to justify the assumption that fencing as an art was practiced before the advent of the rapier in the sixteenth century, although it has been conceded that some crude system of fence must have been necessary for the proper play of the *hâche d'armes* or poleaxe, a weapon about five feet in length, and used with both hands. The knight depended as a rule on the strength and temper of his armor for defense, and on the force and accurate thrust of his lance for attack; but the employment of a shield to ward off attack, by sword or other weapon, sug-

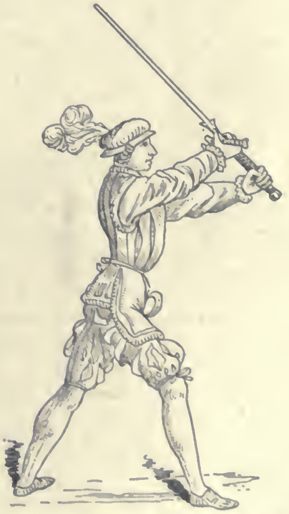


Fig. 1. Fencing position with two-handed sword.

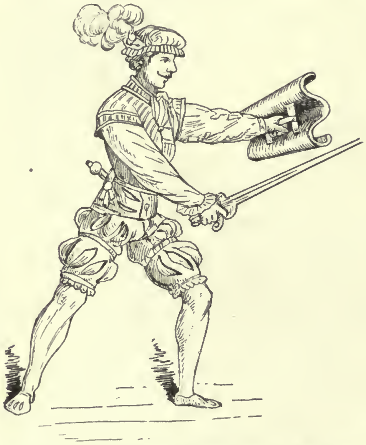


Fig. 2. TWO-EDGED SWORD AND BUCKLER.

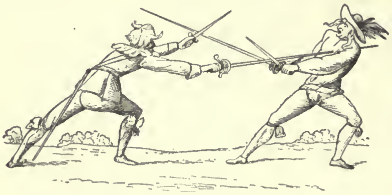


Fig. 3. COMBAT WITH RAPIER AND DAGGER

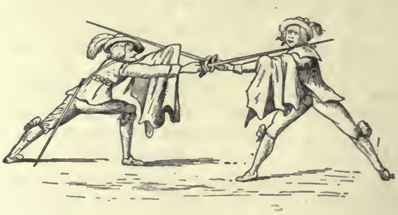


Fig. 4. COMBAT WITH RAPIER AND CLOAK.

gests that some form of fence was known. The swords in use at this time were the heavy two-handed swords (Fig. 1), the bastard sword (a heavy weapon, which, however, might be used with one hand), and the ordinary single-handed sword. Each type was made with double edges and a point. From the middle of the sixteenth to the middle of the seventeenth century was the most prolific period in the variety of weapons introduced, and also the period from which fencing may properly be said to date. The most important weapon of the group was the long Spanish-Italian rapier, with its adjuncts, the poniard (Fig. 3) or the cloak (Fig. 4). It was practically a development of the cross-hilted sword, and arrived at its most perfect form early in the seventeenth century, when the 'swept' hilt gave place to the 'coup.' Armor was no longer worn, so that combatants fought stripped to their shirts, and, owing to the deadly nature of a rapier-thrust, were compelled to cultivate the art of fence. Italian fencing-masters were in demand, but, owing to the length and general unwieldiness of the weapon, their instruction was far from the complex method it afterwards became. In avoiding an opponent's rapier, recourse would be had rather to change of position with the body than to changing positions of the weapon itself, and parries with the dagger were equally few. The period of the rapier has been described as the most quarrelsome period in history. During the reign of Louis XIII. of France, the rage for dueling became more virulent than ever, and the use of the rapier, and consequent knowledge of its practice, grew to be widespread, with the inevitable result of considerably altering the style and size of the rapier. The hilt gradually took the shape of a cup, and the blade was so shortened and lightened that the possibilities of attack and defense were vastly increased, and a weapon for the left hand became unnecessary. The *parry*, and as a natural consequence the *feint*, which with the previous heavy and unwieldy weapon had been impossible, became now an absolute necessity, and combined with the *lunge* marked a great advance in the art of fence. The 'lunge,' or forward movement of the leading foot, was first suggested so far as is known by a celebrated Italian fencing-master of the sixteenth century, di Grassi, whose work published in 1574, and translated into English by 'J. G., Gentleman,' in 1594, was long regarded as an authority. At this time such footwork as was practiced consisted of passes, or steps forward, backward, or to either side; with the addition of *voltes* and *demi-voltes* as needed, during which the swordsman was required to keep the knees as nearly straight as possible. The universal prevalence of dueling (q.v.) during the eighteenth century brought about further improvements in the weapons, and finally evolved the slender feather-weight rapier now known as the *small sword.* The elementary circular, or counter-parry, proved to be of sufficient value to compel sword-makers to alter the shape of the blade, by fining down its excessively broad forte, and making it taper gradually from hilt to point; thus, the 'walking-sword' of the closing decades of the eighteenth century became as light and supple as is the fencing-foil of the twentieth century. Among the many famous fencing men of this period may be mentioned the Chevalier de Saint Georges, the half-breed son of a rich planter of Guadalupe; the French Chevalier d'Eon de Beaumont (1728-1810), so long believed to be a woman; and Angelo, the founder of a family for several generations conspicuous in the annals of fencing in Great Britain. Since the days of armor, up to the eighteenth century, protection for the face or other parts of the body in a fencing-bout was unknown, and all the great fencing masters of the rapier recommended enormous buttons—in many instances, it is recorded, as large as a tennis-ball—which, being affixed to the point of the weapon, afforded a measure of protection to an opponent. During the earlier part of the small-sword period it had also been the custom in the *salles d'armes* for a fencer to withhold his *riposte* after making a successful parry, in order that his opponent might have time to recover from his lunge, and escape any possible injury to his face. The elder La Boessière is said to have been the original advocate of protection for the face, but his idea met with a very indifferent reception from the fencing fraternity, who vehemently denied the necessity of such protection on the part of themselves. When first introduced the mask was of solid metal, in which openings were made for the eyes, and thus left exposed the very parts that most needed protection. An accident, by which a prominent instructor lost the sight of an eye, soon demonstrated the necessity of eye-covering, which in time led to the present meshwork mask. At the beginning of the nineteenth century the use of the glove, plastron, sandals, and mask had become general, and while gentlemen no longer carried the walking-sword, a form of it still holds sway in France, in the *épée de combat*, the favorite weapon of duelists throughout the world.

Fencing in France. It is supposed that Henri Saint-Didier, who taught fencing in Paris about 1570, was the first to give names to the different thrusts then in use, such as *main-drette, renverse, fendante, estocade*, and *imbrocade*. Pater, a later teacher, divided the various parries into five distinct classes, viz.: prime, seconde, tierce, quarte, and quinte; and similarly with few exceptions every other term used in the art has had a French origin. Modern fencing in France owes most of its perfection to the military academy of Joinville-le-Pont, near Paris, established by the Government in 1872, and known as the High School of Military Gymnastics. In this institution are trained the masters-at-arms, who on graduation are assigned to the various regiments and corps of the French Army. The number of men graduated each year, however, is in excess of the number of appointments to be filled, so that many of them are compelled to enter into competition for their livelihood with the prévôts or lieutenants of the civilian masters throughout the country. In Italy fencing is not now so popular as it is in France, nor is the Italian method as practiced by its leading present-day exponents as distinct from the French as it was formerly (although the original Italian method is still enthusiastically taught at Naples), but is apparently being dispossessed by its French rival from all the countries in which it was formerly supreme.

Fencing in the duel is influenced in France largely by the rules governing the use of foils in the *salles d'armes*. There is usually an umpire to enforce the rules and see that the combatants maintain the regulation distances from each other, so that only the hand or arm is in danger. Occasionally a duel will have a fatal termination, either designedly or by accident; but in the vast majority of encounters, should either combatant make too desperate an attack or rush, the umpire interferes, and the first scratch ends the affair. In Germany the duel is more consistently prohibited than in France (see Dueling); but even there, duels with the rapier or dueling-sword are of occasional occurrence, and are almost invariably of a serious character. The student duels are fought with the *Schläger*, a pointed sword with a long double-edged blade, sharpened only toward the point, and the fencing in vogue partakes more of the violence and action of the Italian than the more reserved style of the French.

Some of the more important positions and principles of fencing are as follows: Movements for attack are called thrusts, and those for defense parries; a *feint* is a movement designed to mislead an opponent. When on *guard*, the body is so placed as to present a profile to the opponent; the right foot forward, the right arm half bent, with the elbow at the distance of about ten inches from the body, the left foot 20 inches behind, and at right angles to the right foot, knees bent, body erect and well poised on the hips, inclining slightly to the left, so as to facilitate the right leg in the lunge. The *attack* is an endeavor to hit, either by a simple or a composite thrust; *simple* when resulting from a single movement, and *composite* when resulting from several. A *straight thrust* is a direct hit, obtained by straightening the arms and lunging, and a *disengagement* is a change of lateral lines followed by a straight thrust, which differs from the *coupe* or *cut*, in that it is under instead of over the opposing weapon. To *riposte* is to attack after having parried—either immediately or after a single interval; and to *counter-riposte* is to attack after having parried a *riposte*. The *coupe-de-temps* or *time thrust* is an attack anticipating or surprising an opponent in the preparation of his own; and the *coup d'arrêt* or *stop thrust* is a rapid attack developed during the advance of an opponent. *Feeling the blade* is an operation demanding long practice, as well as a delicate sense of touch; by it, contact without pressure is made with the opposing weapon, which together with the knowledge gained by the eyes will indicate the beginning of an attack, and enable the defense to deflect a thrust without unnecessary violence. An attack may be delivered either at the breast, or on the right (the right side of the body or face), on the left (corresponding to the right attack), and below, the region under the sword-arm. There are at least ten parries requisite to meet all the thrusts that can be directed at the body, designated by the old French ordinal numbers: prime, seconde, tierce, quarte, quinte, six, sept, octave, counter-tierce, and counter-quarte. To confuse an opponent by making a feint, or to secure position after retreating, resort is had to the *appel*, which is executed by striking the right foot smartly on the ground. The art of disarming an opponent by twisting or forcing his weapon out of his hands is but little practiced, owing to modern fencing etiquette, which does not permit the striking of a defenseless man. The essence of good fencing is to exercise caution and prudence before attempting a thrust, and never to riposte until after the parry has been made. Retreats must be covered by parries, which should invariably be well and closely made. To husband the strength and keep cool, together with a constant watchfulness for a successful lunge, constitutes almost certain success against even a superior swordsman, should the latter be impetuous and indiscreet in his lunging. The use of the *small sword* is now principally confined to dueling, and proficiency in its play in non-dueling countries is sought more as an accomplishment, or recreation, than as a means of self-preservation. The small sword is for pointing only, which is of all attacks the most effective, since in fencing the point is made with the full force of the arm reinforced when lunging by the weight of the entire body; a combination impossible in the 'cut,' which can only be delivered by the force of the arm alone. The substitute for the short sword is the foil, and on no account should practice against an adversary be engaged in without the protection of a wire mask for the face. There should also be worn a leather breastplate or pad, to cover the entire right side and hang a little distance over the lower part of the body. It should also have stitched to it a leather collar buttoned at the back, for the protection of the neck.

The *foil* is made of yielding steel, with a leather-covered or rubber button fixed to its point. The temper of the foil should always be ascertained before commencing practice, by placing the point on the ground, and pressing downward, until the blade assumes a considerable arc of a circle, after which it should be allowed to spring back by suddenly releasing the point. A well-tempered foil can at all times be straightened out by placing it under the foot, bent part uppermost, and then drawing it backward to the point.

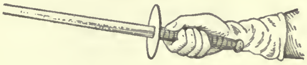


FIG. 5. HAND POSITION, WITH FOIL.

SWORD FENCING. The sword is a weapon made for the purpose of cutting by the delivery of a blow. It has two distinct parts available for attack and defense, in addition to its point: (a) The *centre of percussion*, or that part of the sword in which the greatest force of the blow is concentrated, comprising about one-third of the blade's length from the point; and (b) the *forte*, which measures about one-third the sword's length from the hilt, and in which the best strength for defense is maintained. Although the weight of the sword tells against its utility as a thrusting weapon, it is nevertheless fashioned for use with the point, and the thrust is relied upon as an additional means of attack. Any such scientific use of the sword as is possible with the rapier is entirely precluded by its weight, consequently it has fewer combinations for attack and defense. Sword fencing consists of the cut, guard, and point, a combination equally available in the case of sword versus sword, and sword versus lance or bayonet.

The *singlestick* is a light ash rod or stick, used as a substitute for the sword, the exercises with which are identical.

FENCING IN AMERICA. The most important fencing competitions in the United States are under the direction of the Amateur Fencers' League of America, which is a part of the Amateur Athletic Union. Four competitions are held each year, which are open to amateurs of all countries, viz.: (1) *American Championship*: With foils, dueling-swords, and sabres; (2) *Foil Handicap:* One held by each division of the Amateur Fencers' League of America, at New York, and other centres; (3) *Team Championship:* With foils; teams consisting of three or four men; (4) *Junior Team Championship:* With foils; teams of three men, in which no man is allowed to participate who has ever won any A. F. L. A. foil medal. The intercollegiate championship is usually competed for by teams from the principal colleges and universities of the country. There are many important fencing clubs and organizations throughout the country, the most influential being the Fencers' Club of New York. Philadelphia is regarded as the most important fencing centre next to New York, closely followed by Boston, San Francisco, Chicago, and Saint Louis. The German-American athletic societies in every State of the Union also make fencing a prominent feature of their gymnasia, and more than any other factor maintain a strong interest in broadsword and sabre work.

BAYONET FENCING. The bayonet is a weapon made entirely for the thrust, consequently it is most effectually used when in the hands of an experienced user of the rapier. Of all forms of fencing, that with the bayonet is most exclusively military, yet curiously enough is only within quite recent times receiving the attention it has so long deserved; at a period, too, when in the opinion of many the opportunities for bayonet contact in actual warfare have been reduced to a minimum. The old form of bayonet exercise, like the old manual of arms, is now practically a thing of the past, and is being everywhere superseded by bayonet attack and defense practice, in which bayonet is opposed to bayonet, and the modern principles of fence are employed. For gymnasium bayonet fencing, a spring bayonet is employed; so that when contact is made in the thrust, the impact forces the bayonet back on its spring. When employed against the sabre, the bayonet is used on the same principle as the foil, except that, owing to its weight and form, only the more simple foil movements are possible; the two weapons are on fairly equal terms, however, as the sabre, from its weight and shape, is similarly situated. Whatever advantage the bayonet has in length, the sword has in general handiness. A bayoneteer usually engages in tierce or quarte, from which he is enabled to make a straight thrust, a disengagement, feint a straight thrust and disengage, or feint a disengagement into one line and disengage into another. The swordsman will parry with prime all straight thrusts and disengagements received *over* his blade, and with seconde those received *under the blade.* A greater variety of returns are possible, however, if tierce and quarte are employed to meet a thrusting attack at the breast. Against a dismounted swordsman, the bayoneteer will seek to keep the former outside his point, to secure which he will constantly threaten different parts of the swordsman's body and thus keep him on the defensive. On the other hand, the swordsman will aim to get inside the point of the bayonet, when by seizing the rifle with the left hand he has his opponent at his mercy. Against a mounted swordsman, the bayoneteer will centre his attack on the left or near side of the horseman, and thus shorten the swordsman's reach. If opposed to a lancer (mounted), he will make his attack on the right or lance side, and strive to get inside the point. Manuals of fencing for all fencing weap-

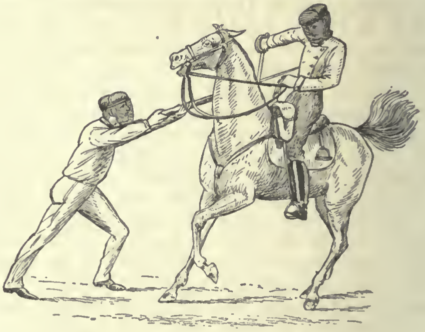


FIG. 6. BAYONET VERSUS SWORD.

ons, and particularly the foils and singlesticks, are plentiful. One of the best books on the subject from the historical point of view is Hutton, *The Sword and the Centuries* (London and New York, 1901). Consult: Thimm, *A Complete Bibliography of Fencing and Duelling* (London, 1896); Czeipek, *Die Fechtkunst im Duell* (Gratz, 1897); Hergsell, *Die Fechtkunst im XV. und XVI. Jahrhundert* (Prague, 1896); Ristow, *Die moderne Fechtkunst* (Prague, 1896); *Praktische Bajonett-Fechtschule nach der Bajonettir-Vorschrift für die Infanterie* (Berlin, 1889); *Bayonet Attack and Defence* (Chatham, England, and Canada).

FENCING THE TABLES. A term applied in Scotch Presbyterian churches to the address before the administration of the Lord's Supper, setting forth who are 'the worthy communicants,' and warning others from partaking.

FEN'DALL, Josias. A proprietary and Colonial Governor of Maryland from 1656 to 1660. He was born probably in England. He was one of Lord Baltimore's trusted agents in his Maryland colony, and as a reward for his services Lord Baltimore made him a large grant of land, and commissioned him Governor. He was unable to enforce his authority, and was taken prisoner by the Puritan faction, but was released on taking oath that he would not interfere with the established government. Leaving Maryland, he proceeded to England, where he conferred with Lord Baltimore, and acted as his adviser in his attempts to secure from Cromwell a recognition of his proprietary rights. In November, 1657, Fendall returned to Maryland as Governor. In the interregnum which followed the abdication of Richard Cromwell, Fendall seems to have deserted his former benefactor; for he placed his resignation in the hands of the Assembly and accepted from it a new commission as Governor. The newly established Government, after a brief existence of six months, was again superseded by the proprietary, Philip Calvert being appointed Governor in place of Fendall, who was imprisoned. He was tried in the following spring and banished, but upon promising obedience was permitted to live unmolested until 1861, when, again being implicated in an insurrection, he was banished and his estates confiscated.

FENDER (from *fend*, abbreviation of *defend*). A device for protecting the sides of ships or boats from chafe or other injury. They are of numerous kinds. Rope fenders, made of large soft rope covered with canvas, are used for heavy boats, surrounding the hull just below the washboard. Cork fenders, much used on board modern vessels, consist of a closely plaited rope netting in the shape of a bag, filled with cork, and supported in place by a small rope. Heavy wooden fenders, which are merely solid cylindrical pieces of pine or other soft wood, are also common. They are three to eight feet long and six inches to a foot in diameter; in some cases they are wrapped with old rope, old fire-hose, or the like. During the Spanish War the desirability of coaling the United States ships at sea developed a special heavy class of fenders; the best of these were made of cotton-bales, lashed with rope (which in some cases was covered with leather where likely to chafe) and supported from the deck by heavy rope slings.

FEN DISTRICT. See Bedford Level.

FÉNELON, fā'n'-lōn', François de Salignac de la Mothe (1651-1715). A distinguished French author and prelate. He was born August 6, 1651, in the Château Fénelon, Province of Périgord, in the present Department of Dordogne. He was the descendant of a family which has given many celebrities both to the Church and to the State in France. His education was conducted at home up to his twelfth year. At a very early age he showed lively interest in the classics and especially in Greek. At the age of twelve he was sent to the University of Cahors, noted at the time for its classical course. Thence he was transferred to the famous Jesuit College Du Plessis in Paris. His success in his studies was remarkable, and at the early age of fifteen he attracted the attention of the literary coterie of the Hôtel Rambouillet. At the close of a brilliant college career, when scarcely twenty years of age, he entered the Seminary of Saint Sulpice, which, under the Abbé Tronson, was worthily fulfilling the purposes of its great founder, Olier. In 1675, at the age of twenty-four, Fénelon received holy orders. For some time after his ordination he was employed in attendance at the hospitals and in other parochial duties of the Parish of Saint Sulpice. In the year 1678 he was made director of the Nouvelles Catholiques, a community of women founded for the purpose of strengthening female converts in the faith and instructing those who desired to abandon heresy. While thus occupied he formed an intimacy with Bossuet and took part in conferences on Holy Scripture held under his auspices. Fénelon looked up to Bossuet almost as a master. At this time, at the request of the Duchess of Beauvilliers, he wrote his book *De l'education des filles*, which was intended only for private circulation. It attracted so much attention, however, that it was given to the public in 1681. (There are several English translations, e.g. "On the Education of a Daughter," Boston, 1856.) The book has been called an anticipatory condemnation of Rousseau's *Emile*. The gentleness, moderation, and charity with which he discharged his duties toward the young converts led to his appointment as head of a mission, which, on the revocation of the Edict of Nantes in 1685, was sent to preach among the Protestant population of Saintonge and Poitou. Here his simple charity and unaffected sympathy accomplished much in converting the inhabitants. He refused to allow force to be employed wherever his authority extended. His success may perhaps be best judged from the fact that a century later, at the time of the Revolution, this part of France, La Vendée, was the only province that took up arms in defense of throne and altar. In 1688 he resumed his duties in the Maison des Nouvelles Converties, and in 1689 was named by Louis XIV. to the highly responsible post of preceptor of his grandson, the young Duke of Burgundy. Bossuet said that the position was a proper reward for merit that took the greatest pains to conceal itself. In this position Fénelon showed himself a great practical educator. While imparting the most varied knowledge, he knew how to prepare the mind and heart of his pupil for the great responsibility that was to be his as the destined ruler of France. He impressed upon him the great principles of truth and justice and the vanity of earthly glory, power, and happiness that are not accompanied by a sense of duty well done. In order to fulfill these lofty purposes to his satisfaction, Fénelon found himself under the necessity of composing his own text-books. To this we owe many works still popular in educational use—the *Fables*, the *Dialogues des morts*, *Abrégé des vies des anciens philosophes*, and the preliminary sketch, at least, of *Télémaque*. There was also a translation of the *Æneid* of Vergil, and a *Vie de Charlemagne*, but unfortunately the first is lost, and the manuscript of the second was destroyed by fire at the burning of the archiepiscopal palace of Cambray in 1697. His services as preceptor obtained for him in 1694 the abbacy of Saint Valéry in the diocese of Amiens, and in the following year the Archbishopric of Cambray. He accepted the archbishopric only on the express condition that he should be allowed to live at his see the nine months of each year required by the canons, and that not even his duties as preceptor royal should interfere with this requirement. During his preceptorship he became acquainted with Madame Guyon (q.v.), a pious widow who was wont to give spiritual conferences to ladies of rank and who had written a *Short and Easy Method of Prayer*, a commentary on certain parts of the Bible, and several other mystical works in which she expounded her views regarding the inner life. Not long before the writings of Miguel de Molinos, the founder of the Quietists, had been condemned as heretical. (See QUIETISTS; MOLINOS.) Molinos taught that perfect contemplation of God is a state wherein one neither reasons nor reflects, but passively receives the impression of heavenly light. In this mental inaction, a soul neither fears hell nor desires salvation. The practice of the virtues of faith, hope, and love becomes unnecessary in this state, which Molinos called 'quiet.' Even vile thoughts and devout aspirations become indifferent. Madame Guyon was not a professed follower of Molinos, but she favored his spiritual doctrine at least to the extent of teaching that in the state of perfect contemplation the soul resigns itself so entirely to the will of God as to care not whether it is to be damned or saved. She professed readiness to submit to the decision of the Church, but her teaching was distinctly dangerous. Bossuet, with characteristic acumen, recognized the danger, but, with what cannot but be considered now as intemperate zeal, harshly condemned where gentle persuasion might have sufficed. Fénelon, convinced of the uprightness of Madame Guyon and her good intentions, defended her. In a book written during the controversy, called *Maximes des saints*, he unconsciously fell into some of the erroneous tendencies of Madame Guyon's teaching. After considerable delay, twenty-three propositions from the maxims were condemned by the Pope, who rebuked the lack of moderation of some of Fénelon's opponents by adding, "He has erred through excess of Divine love, but you have erred through lack of love for your neighbor." Fénelon announced his condemnation to his own people at once and expressed his full submission. He seemed happy to give an example of docility and humility to his flock. Afterwards he presented a golden ostensorium to his cathedral on which appeared the figure of the angel of Truth trampling on forbidden books. One of the titles in evidence was *Maximes des saints*. After this unfortunate episode Fénelon devoted himself entirely to the care of his diocese. The fame of his benevolence and enlightened charity spread far and wide. When the region about Cambray was invaded by the armies of Marlborough and Prince Eugène, those commanders gave strict orders to respect the estates of Fénelon, and, in a time of great scarcity, Marlborough provided a guard to protect the Archbishop's granaries. Notwithstanding these precautions, his valuable library was burned. In it were some of his precious manuscripts not yet given to the printer. Fénelon's only remark was, "I would much rather that this were destroyed than the cottage of some poor peasant." Fénelon fell into disgrace at Court by reason of his *Télémaque*, which was regarded as a masked satire upon royalty and its surroundings. The work had been printed from a copy surreptitiously obtained by the Archbishop's servant. Critics freely pointed out the characters presumably satirized. Sesostris was supposed to represent the Grand Monarch himself; Calypso, Madame de Montespan; Protesilaus, Louvois; and Eucharis, Mademoiselle de Fontanges. As Louis XIV. fell into decline, there were hopes that Fénelon would be the Minister of the Duke of Burgundy when he should follow his grandfather to the throne. Fénelon even sketched a complete scheme of political reform, which he sent to the Duke, who still retained, in spite of the King's adverse influence and continued hostility, all his pristine affection for his former preceptor. Fénelon's political maxims were far in advance of the time. These hopes were disappointed by the premature death of the Duke in 1712. Fénelon survived him only until January 7, 1715, dying in sentiments of the greatest piety and resignation to the Divine Will. Consult his works (23 vols., Paris, 1820-30), and his letters (11 vols., ib., 1827-29); *Lettres et opuscules inédits* (ib., 1850); Bausset, *Vie de Fénelon* (3 vols., ib., 1808); Crauslé, *Fénelon et Bossuet* (Paris, 1895), in favor of the latter; Sanders, *Fénelon: His Friends and His Enemies* (London, 1901); Viscount Saint Cyres, *François de Fénelon* (London, 1901).

FÉNELON, FRANÇOIS DE SALIGNAC DE LA MOTHE (1641-79). A French missionary in America, a half-brother of the great Fénelon. He entered the Order of Saint Sulpice in 1664, and in 1666, when there came a request from Bishop Leval at Quebec for volunteer missionaries in the New World, Fénelon was one of the first to respond. In 1668 he established a Sulpician mission among the Cayugas on the Bay of Quinté on the north shore of Lake Ontario. On Easter Sunday, 1674, Fénelon preached a sermon at Montreal in which, in describing the ideal chief magistrate, he made a covert attack on Frontenac. The Sulpicians disclaimed responsibility for the sermon, but the question of the privileges of their Order being raised, they defended him. Fénelon was summoned to appear before the council at Quebec, which hesitated to act, but Fénelon returned to France and he was commanded by the King not to return to Canada.

FENELON FALLS. A township of Victoria County, Ontario, Canada, 16 miles north of Lindsay, between Cameron and Sturgeon Lakes (Map: Ontario, E 3). Its name is associated with a picturesque waterfall 20 feet high and 300 feet wide. It has lumber industries and river traffic. Population, in 1891, 1219; in 1901, 1132.

FEN'ESTEL'LA (Lat., little window). A fossil polyzoan found in rocks of Ordovician to Permian age and especially abundant in those of the Devonian and Lower Carboniferous series. The fragile colonies formed by the animals are fan-shaped or funnel-form, and when examined with a lens are seen to consist of radial branches that diverge from a common rootstock and that bear on their inner surfaces the minute cells in which lived the individual animals. These radial branches are joined by frequent horizontal threads that give rigidity to the network. For illustration, see POLYZOA.

FENESTELLA (c. 51 B.C.-19 A.D.). A Roman historian who flourished under Augustus, and, according to the elder Pliny and Jerome, died at the age of seventy, during the reign of Tiberius. He wrote a work of twenty-two volumes, entitled *Annales*, from which Plutarch derived some material for his *Lives* of distinguished Romans, and which was used as an authority by Asconius Pedianus in his commentaries on Cicero's orations. The few fragments preserved relate almost exclusively to events subsequent to the Carthaginian wars, but whether the work embraced all or only a portion of the period from the foundation of Rome to the downfall of the Republic cannot be determined. It is certain, however, that it included the greater part of Cicero's career. The *De Sacerdotiis et Magistratibus Romanorum*, which was formerly attributed to Fenestella, was the work of Fiocchi, a native of Florence who lived during the fourteenth century. The fragments of the *Annales* are collected in Peter's *Historicorum Romanorum Fragmenta* (Leipzig, 1883). Consult: Mercklin, *De Fenestella Historico et Poeta* (Dorpat, 1844); and Poeth, *De Fenestella Historiarum Scriptore* (Bonn, 1849).

FÊNG-HWANG, fĕng'hwäng'. See FUNG-HWANG.

FENIAN SOCIETY. A political association of Irish and Irish-Americans, the object of which was the overthrow of English authority in Ireland, and the establishment of a republic there. It has been said, and is generally supposed, that the movement originated in America, and was transplanted to Ireland; but, as a matter of fact, the plans for both the Irish and American organizations were drawn in Paris by a small group of the Irish revolutionary exiles of 1848.

The Irish Society was organized by the efforts of James Stephens, who in 1853 traveled through Ireland, and organized the small centres of disaffection into a powerful conspiracy. It was necessarily secret, and known as the Irish Revolutionary Brotherhood (popularly called I. R. B.). Its aim was to convert the people of Ireland into a soldiery capable of resisting the British Army. Stephens himself was the absolute military head, known as chief organizer (C. O.). He was assisted by four executive officers (one for each Irish province), known as 'V's' (vice-organizers), and chosen by himself. The 'V's' selected 'A's' (colonels), who in turn selected 'B's (captains) to choose and drill the 'C's' (privates), who were all able-bodied men capable of bearing arms. The political programme of the Brotherhood contemplated the establishment of an independent republic based on universal suffrage, and peasant proprietorship of the land. The possessions of hostile landlords were to be confiscated and optional purchase was to be made at fair prices in other cases. Church property was to be confiscated, and the clergy were to be paid by the State. All religions were to be alike before the law.

The American society was organized at the same time by John O'Mahoney, according to the arrangements made in Paris, but did not obtain a really good footing until the arrival of Stephens in 1858. Its principal object was to supply money and arms to the Irish branch. In America the ability to bear arms was not a necessary qualification for membership. At the head was O'Mahoney, called the head centre, who appointed his own central treasurer, assistant treasurer, and central secretaries. He also commissioned State centres, on the recommendation of delegates from circles. The State centres commissioned district centres, who in their turn organized circles (local associations). The membership dues were nominal, but the society received large sums as voluntary contributions. The Fenian convention, which met in Chicago in October, 1863, made the constitution of the society more democratic, by making the office of head centre elective. The growth of the Fenian Society was very rapid. The American branch quickly spread into Canada, and the Irish branch into western England and Scotland. The funeral of Terence McManus, an exile of 1848, who died in San Francisco, gave occasion for demonstrations of mourning in America and Ireland, which greatly increased the number of Fenians. Two newspapers, *The Phœnix* in New York, and *The Irish People* in Dublin, were the official organs of the society. The effort of the Fenians made to win over Irish soldiers in the British Army is claimed to have been successful, but this is denied. Being a secret society in Ireland, it necessarily fell under the ban of the Catholic hierarchy, although the lower clergy sympathized with and in some cases participated in the movement. In America the clergy were divided in sentiment.

The Civil War in the United States gave the Fenians a great opportunity to obtain military training. A large part of the Irish soldiers engaged on both sides in the struggle were Fenians, and at the end of the war there was a formidable number of trained soldiers ready to fight for Ireland. It was believed in Irish circles that a definite understanding existed between the Federal Government and the head centre to the effect that after the war in America was ended the Fenians should receive material assistance. When the American officers went to Ireland to assist in drilling and leading the expected recruits, they found the organization not sufficiently advanced for active military measures.

Meanwhile the British Government had kept itself informed of the movement by the aid of informers and spies. In 1865 it suddenly suspended the habeas corpus act and caused the chief leaders of the Brotherhood to be arrested. Stephens escaped from prison and fled to America, where he was joyfully received by the American branch and made head centre. But his repeated failures to send a military expedition to Ireland displeased the society, and he was deposed. All the military efforts of the Fenians were unsuccessful. A proposed expedition of 10,000 men into Canada resulted in 500 men crossing the border in 1866. They defeated the Canadian militia, but had to return to the United States on account of the failure of the organization to provide them with reinforcements and supplies. Their leaders were arrested by the American authorities. A daring attempt to seize the arms and ammunition stored in Chester Castle, and convey them by ship to Ireland, was thwarted in 1867. The general uprising in Ireland which was to follow the seizure was suppressed at every point. The rescue of two leaders by a band of Manchester Fenians resulted in the death of a police officer, for which three of the rescuers were hanged. The demolition of the wall of Clerkenwell prison and various Fenian threats threw the British authorities into a state of great alarm. Another attempt to raid Canada was suppressed by the United States Government in 1871. This was the last effort of the Fenians.

The cause of the repeated failures of the Fenians is to be found in the fact that they had no real leaders. Stephens was a model organizer, but not a man of action. O'Mahoney was loyal to the order, but not a man of ability. There were endless dissensions among the leaders in both countries, besides much corruption, especially in the American branch. The dual organization in Ireland and America prevented harmony of action. But although they failed in their immediate object, their attempted uprising tended to convince English statesmen that it would be better to grant proposed reforms in Ireland than to be constantly engaged in suppressing revolts.

The name has been the subject of much discussion. O'Mahoney, who was a student of Old Irish lore, gave the name Fenian to the society. This name he derived from *Fionna Eirinn*, an ancient military organization which existed in Ireland, taking its name from Finn, the celebrated hero of Irish legend. Officially the name Fenian applied to the American branch only, but in the mind of the public it became connected with the entire movement. At first the Irish branch was popularly known as the Phœnix Society, owing to the aid Stephens received from the Phœnix Club, especially in counties Kerry and Cork. This club was suppressed by the Government in 1858. The real name of the Irish branch was, as before stated, the *Irish Revolutionary Brotherhood.* Consult: Gibbons, J., *Proceedings of the First National Fenian Convention Held at Chicago, 1863* (Philadelphia, 1863); *The Government Proceedings Against Fenianism* (London, 1865). The most detailed account of the movement is J. Rutherford, *Secret History of the Fenian Conspiracy* (2 vols., London, 1877). partisan English; A. M. Sullivan, *New Ireland* (Philadelphia, 1878), chs. 17-25, is partisan Irish, as is J. Savage, *Fenian Martyrs and Heroes* (Boston, 1864), the author of which was himself a Fenian. A good brief account of the movement, Irish in sympathy, is to be found in Justin McCarthy, *Ireland Since the Union* (London, 1877), chs. 14-17.

FENIN, *fe*-năɴ′, Pierre de (?-1506). A French chronicler, born in Artois. His chronicle was for a long time attributed to his father, another Pierre, who died in 1433. It consists of an account of the rivalry between the Armagnacs and the Bourguignons, from the murder of the Duke of Orleans (1407) to 1427. The second part is not in the old editions. It describes the first five years of the reign of Charles VII. The best modern edition of the *Chronique de Fenin* is that by Mlle. Dupont (1837).

FENN, George Manville (1831—). An English journalist and author, born at Westminster. He was early a contributor to *Chambers' Journal*, the *Star*, and *Once a Week;* became editor of *Cassell's Magazine* in 1870, and proprietor of *Once a Week* in 1873. He made himself known as the writer of a very extensive list of boys' stories, which have been circulated in many countries, and have proved quite as popular in the United States as in England. His publications include also several novels, such as *A Crimson Crime* (1899), and *The Cankerworm* (1901).

FENN, Harry (1838—). An American painter and illustrator, born in Richmond (Surrey), England. He removed to the United States in 1857, and was one of the founders of the American Water Color Society. He has exhibited work in oil and water-color, and is a well-known illustrator. He made the sketches for *Picturesque America*, *Picturesque Europe*, and *Picturesque Palestine.*

FEN′NEC (from Ar. *fanaka*, to remain in a place), or Zerda. The smallest of the canine tribe—a pretty little fox-like animal (*Canis*, or *Fennecus, zerda*) of the Sahara. It is about fifteen inches long, besides the tail, which is nearly seven inches in length, and bushy like that of a fox. The general color is pale rufous cream, harmonizing with the desert sands; the breast, inside of the ears, and eyelids are white, and the tail is tipped with black. The erect ears are of enormous size—each as large as the face, giving a quaint air of intense alertness to the graceful little creature. It digs, with remarkable speed, a burrow in the sand, often escaping pursuit by fairly *diving* into the ground; and in its burrow, which is furnished with soft bedding, and is remarkably clean, it sleeps most of the day, going abroad at dusk to steal cautiously to some drinking-place, and then to seek its prey, which consists of mice, small birds, lizards, insects, etc. The name is sometimes extended to related African species, such as Rüppell's fennec (*Canis famelicus*), the pale fox (*Canis pallidus*), and the asse (*Canis chama*) of the Transvaal. See Plate of Foxes and Jackals.

FENNEL (AS. *fenol*, from Lat. *fœniculum*, fennel, diminutive of *fœnum*, *fœnum*, hay), *Fœniculum.* A genus of umbelliferous plants allied to dill (q.v.). The flowers are yellow. All the species are aromatic, and have much-divided leaves with thread-like segments. The best-known is common fennel (*Fœniculum officinale*), a native of the south of Europe. It is a biennial, three or four feet tall, cultivated in many gardens in both Europe and America, chiefly for the sake of its leaves, which are used for flavoring, but also for its aromatic seeds. Florence fennel, sweet fennel, Italian fennel, or Cretan fennel (*Fœniculum dulce*) is an annual of humbler growth, much cultivated in the south of Europe. The enlarged bases of its leafstalks, after being bleached like celery, are boiled and served with drawn butter like cauliflower. The fruit (seed) is longer and paler than that of common fennel, has a more agreeable odor and flavor, is the favorite aromatic condiment of the Italians, and is used in medicine. Oil of fennel, an aromatic, stimulant, and carminative essential oil, is also made from it. Cape fennel (*Fœniculum capense* or *Carum capense*), found in the vicinity of the Cape of Good Hope, has a thick, aromatic esculent root. The Panmuhoree of India (*Fœniculum Panmorium*) is a species of fennel much cultivated in its native country for its sweet, warm, and aromatic fruit, which is much used as a carminative, and in curries. The 'giant fennel' of the south of Europe is a plant of a different genus (*Ferula*), and abounds in a fœtid juice. It is, indeed, closely allied to asafœtida. The species mentioned above, except Fœniculum capense, have recently been combined under the name Fœniculum vulgare.

FENNEL (*Fœniculum officinale*).

FENNEL-FLOWER. See NIGELLA.

FEN'NELL, JAMES (1766-1816). An English actor and writer, who came to America in 1793. He was born in London, and was educated at Eton and Cambridge, but his extravagant habits ended his university career, and he undertook to support himself upon the stage. His first appearance was in Edinburgh, in 1787, as Othello, which remained a favorite rôle. His success as an actor, at Covent Garden, London, and elsewhere, was marred, however, by his financial difficulties. At Richmond he produced his comedy *Lindor and Clara* (published in 1791). The same year he visited Paris and published later *Proceedings at Paris During the Last Summer* (London, 1792). About this time he married, and the following year an invitation to play in Philadelphia brought him to the United States. He acted for some time in the principal American cities, but his unstable impulses led him into various occupations, including teaching in Charlestown, the establishment of a salt business in New London, Conn., and the effort to found a school in Philadelphia. His last years were largely a struggle with poverty. His final appearance on the stage as King Lear, in Philadelphia, the year before he died, was a pitiful failure. Consult his *Apology for the Life of James Fennell* (Philadelphia, 1814).

FEN'RIR. In Norse mythology, the offspring of Loki (the evil genius) and Angurboda (anguish-boding), a giantess from Jötunheim. Loki had a legitimate wife, Sigyn; but by Angurboda he became the father of three monsters: (1) the wolf Fenrir; (2) the Midgard Serpent; (3) the Goddess of Death, whose name is Hel. Fenrir was bred among the gods, but only Tyr had the courage to give him food. When the gods saw how much he increased daily, and remembered that the predictions were that he was destined to be their destruction, they endeavored to chain him. But he easily broke the first two chains. Then they made a third. It was composed of the sound of a cat's footsteps, a man's beard, the roots of a mountain, a fish's breath, and a bird's spittle. Fenrir suspected some trick in this, and he said: "If ye bind me so fast that I cannot free myself again, I am well convinced that I shall wait long to be released by you. I am, therefore, not at all desirous to let the cord be fastened upon me. But rather than that ye shall accuse me of want of courage, let one of you place his hand in my mouth as a pledge that there be no guile in the case." The gods hesitated, but finally Tyr put his hand in the wolf's mouth, and the wolf in his vain struggles to break the chain bit off the hand. Fenrir could not break the magic chain, and became a captive to the gods until Ragnarök—the end of time—comes. Fenrir will then break loose, his upper jaw will touch heaven, his nether jaw the earth; fire will blaze from his eyes and nostrils. In the tremendous tumult which precedes the general dissolution, the wolf will swallow Odin (father of gods), and so cause his death. But at the moment will come Vidar, the silent god, who wears a wonderful shoe made from shoe-parings since time began. With that shoe he will hold down Fenrir's lower jaw, and with his hands tear off the upper jaw, and thus will the monster wolf be slain. See SCANDINAVIAN MYTHOLOGY.

FEN'TON. A town of Staffordshire, England, almost adjoining Stoke-upon-Trent on the southeast, on the North Staffordshire Railway (Map: England, D 4). It has manufactures of porcelain and machinery. Population, in 1891, 16,998; in 1901, 22,742.

FENTON. In Shakespeare's *Merry Wives of Windsor*, a suitor for the hand and fortune of Anne Page, who elopes with him.

FENTON, ELIJAH (1683-1730). An English poet, born at Shelton, Staffordshire. He studied at Jesus College, Cambridge, and became secretary to the Earl of Orrery in Flanders. Subsequently he was head-master of the grammar school at Sevenoaks (Kent), instructor in literature to Craggs, the Secretary of State, and tutor to a certain young Trumbull of Easthampstead (Berkshire). With Broome he assisted Pope in the latter's translation of the *Odyssey*, executing the first, fourth, nineteenth, and twentieth books in so clever an imitation of Pope's manner that his share cannot be distinguished by any internal test. He wrote a tragedy, *Mariamne*, presented in 1723, and published a collection of poems (1707) and an admirable edition of the works of Edmund Waller (1729). "Fenton," says Johnson, "may be justly styled an excellent versifier and a good poet."

FENTON, Reuben Eaton (1819-85). An American politician. He was born at Carroll, N. Y.; studied law, was admitted to the bar in 1841, and practiced for a time at Jamestown, N. Y., but afterwards gave up the profession of law and became a merchant. He was a Representative in Congress from 1857 to 1864, and was then Governor of New York until 1896, serving two terms. During the Civil War he was a stanch supporter of the war measures of Lincoln and his Cabinet. He was a United States Senator from 1869 to 1875, and in 1878 was chairman of the United States Commission at the International Monetary Conference at Paris.

FEN'UGREEK (AS. *fenogrecum*, from Lat. *fœnum Græcum*, Greek hay), *Trigonella*. A genus of plants of the natural order Leguminosæ, allied to clover and melilot. The leaves have three obovate leaflets and scythe-shaped stipules. The flowers generally have the keel very small, so that the wings and standard present the appearance of tripetalous corolla. The common fenugreek (*Trigonella fœnum-græcum*) is an annual, native of eastern Europe and western Asia, naturalized in the Mediterranean region, where, as in India, it has long been cultivated as a fodder plant and for its strong-smelling, oily seed, which is used in Egypt and the East in bread and curry-powder. In medicine it is now used only in external applications, but is still employed internally in veterinary practice as an ingredient in condition powders. It is the common flavoring substance of patent stock foods, which owe their strong, not unpleasant odor to it.

FEN'WICK, George (c.1603-57). An English Parliamentary leader and colonist in America. He studied law, was called to the bar at Gray's Inn in 1631, and became one of the patentees of the Connecticut Colony in 1635, visiting Boston in the following year. In 1639 he removed with his family to Saybrook, Conn., where he represented the patentees and held the office of Governor until 1644. In 1645 he disposed of most of his property at Saybrook, and returned to England, where, in the same year, he was chosen to the Long Parliament from Morpeth. He served in the Civil War as a colonel of militia, and became Governor of Berwick after its fall in 1648. He was one of the Parliamentary commissioners for the King's trial, but did not act. He was with Cromwell in his invasion of Scotland in 1650, and after serving as Governor of Edinburgh Castle, became, in 1651, one of the commissioners for the government of Scotland. He was a member of the Parliaments of 1654 and 1656 from Berwick.

FENWICK, or **FENWICKE,** John (1618-83). An English Quaker colonist in New Jersey. Acting in conjunction with or as a trustee for Edward Byllynge (q.v.), he bought for £1000 the interest of Lord Berkeley in the Province of New Jersey, in March, 1673, and two years later led the company of Quakers which emigrated from England in the ship *Griffin* and founded Salem, N. J., the first English settlement in West Jersey. He and Byllynge soon became involved in a dispute over the extent of their respective shares in the purchase, but an adjustment was made by William Penn, who was called in as arbitrator, and who awarded one-tenth of the territory to Fenwick and the remainder to Byllynge. Fenwick, however, soon executed a contingent lease for 1000 years to John Eldridge and Edward Warner, and the property eventually passed out of his hands. After his arrival at Salem a controversy arose between him and Governor Andros of New York over the question of jurisdiction, and late in 1676 he was arrested, taken to New York, and forced to give his parole that he would not assume any authority on the east side of the Delaware River until regularly authorized to do so by Andros or the Duke of York.

FENWICK, Sir John (c.1645-97). An English conspirator, the eldest son of Sir William Fenwick, of Wellington Castle. He served in the army and advanced to the rank of major-general. In 1677 he was elected to Parliament. It was he who brought up the bill of attainder against the Duke of Monmouth in 1685. After the accession of William III., for whom he had a personal dislike, he remained an ardent Jacobite, and was involved in numerous plots against the King. He entered into the conspiracy known as the Assassination Plot (1695), and in the following year was arrested and committed to the Tower. His family connections and political backing might have brought him a pardon, had it not been for his own action in attempting to implicate Marlborough, Godolphin, Shrewsbury, and other Whig leaders in the plots. This procedure lost him supporters and made possible the passing of the bill of attainder against him, with little opposition. He was beheaded on Tower Hill on January 28, 1697, being the last person executed in England in consequence of attainder.

FÉNYES, fā'nyĕsh, Alexius (1807-76). A Hungarian geographer and statistician. He was born at Csokály (County of Bihar) and was educated at Grosswardein and Pressburg. After spending two years at Budapest and in European travel, he succeeded in collecting reliable data for his standard geographical and statistical works on Hungary. In 1835 he became permanently established at Budapest, where his principal works were written. These include a voluminous historical and geographical report on the contemporaneous conditions of Hungary (1836-39), for which work 200 ducats were awarded by the Learned Society of Hungary; *Magyarország Statistikája* (2d ed. 1844); and a school atlas of Hungary. In 1848 Fényes was appointed chief of statistics in the Ministry of the Interior.

FEODOR, fā'ŏ-dôr, Feodorovitch. See Berg, Friedrich Wilhelm Rembert.

FEOFFMENT, fĕf'ment (OF. *feoffement*, from *feoffer*, *fieffer*, *feffer*, to enfeoff, from *fief*, *fien*, *fen*, *fied*, *fee*, from ML. *feudum*, property held in fee, from OHG. *fihu*, Ger. *Vieh*, AS. *feoh*, Goth. *faihu*, cattle; connected with Lat. *pecus*, Skt. *pasu*, cattle). The oldest, and for a long period the only, method for the conveyance of freehold land known in England. It was a ceremonial mode of conveyance which rested upon and was derived from the primitive notion that an actual physical transfer of possession is essential to the transfer of title. It consisted in the formal conveyance of the land from the feoffor to the feoffee, the former stating distinctly the measure of the estate conferred, whether it was in fee, in tail, or for life. This conveyance of the land, in order to be complete, required to be accompanied by livery of seisin ('delivery of possession').

Livery of seisin was of two kinds—by deed, and in law. In the former case, the parties being actually upon the land, the feoffor, by delivery of a twig or a turf, testified his conveyance of the land. In livery in law, the parties being in sight of the land, the feoffor, referring to the land, gave possession to the feoffee by indicating or describing the parcel to be conveyed. This mode of making livery was ineffectual unless the feoffee entered into possession during the life of the feoffor. Livery in deed might be effected by attorney; but livery in law only by the parties themselves. In the earliest times these ceremonies completed the conveyance. But by degrees the practice of embodying the transaction in a deed was introduced. When a deed was used it was customary to indorse on the deed the fact that livery of seisin had been made. But it was still the livery and not the deed which effected the conveyance. By the Statute of Frauds (29 Car. II., c. 3) it was declared that no estate created by livery of seisin, unless accompanied by a writing signed by the party or his agent, should be of any effect, except as an estate at will, and by 8 and 9 Vict., c. 106, 3, a feoffment is void unless accompanied by deed.

The law formerly gave so great an effect to a feoffment that even when the party ostensibly making the conveyance was not lawfully seized of the estate, the feoffment was sustained. This was called a tortious conveyance; the party in whose favor it was made was said to have acquired an estate by wrong, the rightful owner was disseised, and was left to his right of entry (q.v.). But by the statute last mentioned this tortious effect of a feoffment was destroyed. The practice of feoffment above described, and which has existed in England from time immemorial, differed materially from the old form of investiture in use in strictly feudal times, and from that which still prevails in Scotland. In England the transaction was simply a conveyance by the actual holder of the land to a new tenant, attended by certain ceremonies, but requiring no confirmation by a third party to complete it. But by feudal usage every holder of land was the vassal of some superior lord, to whom he owed suit and service, and without whose consent he could not part with his land; hence no conveyance was complete without the reception of a new tenant by the lord paramount as his vassal. In like manner, to this day, in Scotland, no transfer of a heritage is complete without formal confirmation by the superior; and although by recent legislation the old feudal usages have been abolished, yet the fact of acceptance by the superior, and the performance of the pecuniary services attendant on that acceptance, are still preserved. See CONVEYANCE; FEE; FEUDAL SYSTEM.

FE′RÆ (Lat. nom. pl., wild). In the Linnæan system of zoölogy, an order of mammals including nearly all of the modern order Carnivora, plus several genera now ranked under the Insectivora and Marsupialia. In modern zoölogy, the term is little used.

FE′RÆ NATU′RÆ (Lat., animals, wild of nature). In law, animals of wild nature and habits, in contradistinction to domesticated animals. At common law, they are not the subjects of absolute property, and persons having them in possession are bound at their peril to keep them from doing harm. A qualified property in them may be gained by taming or confining them, or by reason of owning the land on which are their habitual resorts, or by reason of their inability to wander from such land, or by reason of an exclusive legal privilege of hunting, taking, and killing them. Even in such cases, if the animals escape from the possession of the qualified owner or from his land, and are thus at liberty in accordance with their wild nature and habits, the qualified property ceases, and any stranger may take them without incurring any liability to the possessor. In accordance with this doctrine it is held that if a swarm of bees fly from the owner's land, they remain in his possession so long as he keeps them in sight and is able to possess them; but if they escape from his pursuit and light upon the land of another, the latter may hive and keep them. It is also held that a landowner has a qualified property in a swarm of wild bees in his woods, and a stranger can acquire no title to them by finding and taking them there without such owner's consent.

The liability of a person who has in his possession animals *feræ naturæ* is virtually that of an insurer of the safety of others against harm from such animals. It has been held, therefore, that one who keeps an elephant does so at his own risk, and an action can be maintained for an injury done by it, although the owner had no knowledge of its mischievous propensities. Consult the *Commentaries* of Blackstone and Kent; also Darlington, *On Personal Property* (Philadelphia, 1891); Schouler, *Treatise on the Law of Personal Property* (3d ed., Boston, 1896).

FERAMORZ, fĕr′ȧ-môrz. The young poet in Moore's *Lalla Rookh*, who tells stories to Lalla Rookh on her journey, and gains her heart. On the wedding day he is revealed as the Sultan to whom she is already officially betrothed.

FÉRAUD-GIRAUD, fā̇′rō̇′zhē̇′rō̇′, LOUIS JOSEPH DELPHIN (1819—). A French jurist, born at Marseilles. He studied at the University of Aix, and became a judge in that city in 1851. In 1878 he was appointed a councilor of the Court of Cassation. He published several legal works, including *Servitudes de voirie* (1850-52); *Traite de la grande voirie et la voirie urbaine* (1865); *Occupation militaire* (1881); and *Code des mines et des mineurs* (1887).

FER-DE-LANCE, fâr′de-läns′ (Fr., iron of the lance). A tropical American venomous snake (*Lachesis lanceolatus*) of extraordinary virulence. It is a pit-viper, or crotalid, of the subfamily Lachesinæ, and hence closely related to the northern copperhead, the bushmaster (qq.v.), and others of South America and Indo-Malaysia. It resembles a rattlesnake, but has a tapering tail ending in a hard point (hence one name is 'rat-tailed viper'), not rattle; reaches a length of seven feet, and is reddish-yellow brown, marked with a black stripe from the eye to the neck, and irregular dark cross-bands; sometimes the sides are bright red. It inhabits nearly all South and Central America, and is everywhere dangerously abundant, being remarkably fecund. It is greatly dreaded, especially at night, when it wanders about. During the day it lies coiled in the fields and roadside herbage, and, unlike almost all other snakes, will attack without warning or waiting for disturbance. Its bite is most likely to prove fatal, and even when the patient recovers it produces long-continued after-effects. The snake is of service, on the other hand, in keeping down rats, etc., destructive to sugar-cane. It is most conspicuous in the French Antilles, where alone it is known by this name. Its introduction to the islands of the mungoos (q.v.), in the hope that it might thus be exterminated, has proved useless. The best account of the fer-de-lance is that by Ruz, *Enquête sur le serpent de la Martinique* (Paris, 1859). Consult also, Gadow, *Amphibia and Reptiles* (London, 1901).

FER'DINAND I. (1503-64). Holy Roman Emperor from 1556 to 1564. He was born at Alcalá, Spain, March 10, 1503, and was the second son of Philip of Austria and the younger brother of Charles V. of Germany (Charles I. of Spain), who soon after his accession to the Imperial throne transferred the hereditary Austrian possessions of the Hapsburgs to Ferdinand. In 1521 he married Anna, sister of King Louis II. of Hungary and Bohemia. When Louis fell at Mohács in 1526 in battle with the Turks, leaving no issue, the crown of Hungary was claimed by Ferdinand in right of his wife, and part of the nobles chose him King. He was at the same time placed by election upon the Bohemian throne. In Hungary Ferdinand became involved in a long struggle with a rival, John Zápolya, the Waywode of Transylvania, who laid claim to Hungary, and who was supported by the Turks. The question was at last settled in 1538 by a division of the kingdom between the rivals, with the understanding that the Austrian line should have the succession to the whole. But in 1540, at the death of John Zápolya, the agreement was not kept, and the Turks carried on the war on behalf of his son Sigismund, while they themselves appropriated a large part of the kingdom. In 1547 peace was purchased by means of a yearly tribute to the Turks, but the war was again renewed in 1552 and ended in the retention of their conquests by the Turks. Meanwhile Ferdinand had acted as regent in Germany during the frequent absences of Charles V., and in 1531 had been chosen King of the Romans. In 1552 he acted as mediator between Charles V. and Maurice, Elector of Saxony, and concluded the Peace of Passau with the Protestants. In 1556, on the abdication of Charles V., Ferdinand mounted the Imperial throne. The concessions he had made to the Protestants caused Pope Paul IV. to refuse to acknowledge him. His successor, Pius IV., was more complaisant; but the Electors resolved that for the future the consent of the Pope should not be asked; and this was carried out. Ferdinand made several attempts to reconcile the Protestants and Catholics, and fruitlessly urged upon the Council of Trent the reformation of abuses. He effected institutional reforms, notably in connection with the Aulic Council (q.v.), and he reformed the German currency. He died in 1564, leaving the reputation of a prudent and enlightened ruler, and was succeeded by his son, Maximilian II. The most elaborate work on his reign is Bucholtz, *Geschichte der Regierung Ferdinands I.* (Vienna, 1831-38); consult also: Oberleitner, *Oesterreichs Finanzen und Heerwesen unter Ferdinand I.* (Vienna, 1859); Rosenthal, *Die Behördenorganisation Kaiser Ferdinands I.* (Vienna, 1887). See AUSTRIA-HUNGARY; GERMANY.

FERDINAND II. (1578-1637). Holy Roman Emperor from 1619 to 1637. He was born at Gratz, July 9, 1578, and was the son of Charles, Duke of Styria, and grandson of the Emperor Ferdinand I. His mother, Mary of Bavaria, was a fervent Catholic, and from her, as well as from his Jesuit instructors at Ingolstadt, he imbibed that hatred of Protestantism which is the keynote to the policy of his reign. In 1590 he succeeded his father in the duchies of Styria, Carinthia, and Carniola. As soon as he was of age, he proceeded to stamp out Protestantism in his dominions by annulling his father's act of toleration and expelling the Protestant pastors. He joined with Maximilian of Bavaria in forming the Catholic League, the ostensible object of which was the protection of the Roman Catholic interests in Germany. In 1617 Ferdinand was crowned King of Bohemia, while the Emperor Matthias was still reigning, and the year following he was crowned King of Hungary as well. The Protestants of Bohemia had enjoyed religious toleration since 1609, but Ferdinand, as regent of the kingdom, showed little regard for the rights of his heretical subjects. A dispute regarding the right of the Protestants to build new churches precipitated a conflict. All petitions to the Emperor proving vain, the Protestants under Count Thurn rose in Prague in May, 1618, invaded the council chamber of the castle, and threw two members of the Council of Regency, Martinitz and Slavata, out of a lofty window. They then organized a national government, and a Bohemian army under Count Thurn advanced to the Austrian frontier. This was the beginning of the Thirty Years' War (q.v.). The death of Matthias, early in 1619, left the Imperial succession open to Ferdinand, but at this juncture he was besieged in Vienna by the victorious Thurn. The opportune victory of Bucquoi over Mansfeld and the approach of a force under Dampierre caused Thurn to withdraw, and Ferdinand was able to proceed to Frankfort and receive the Imperial election, August, 1619. Two days before his election he had been deposed in Bohemia and the crown offered to Frederick V., Elector Palatine of the Rhine (q.v.). This prince, who was son-in-law to James I. of England, accepted the dignity, but was ousted from his new dominions by the army of the Catholic League under Tilly, which won the battle of the White Mountain, near Prague, November, 1620.

As soon as his success in Bohemia was assured, Ferdinand proceeded to extirpate Protestantism in that knigdom by the most violent persecution. In Hungary, however, he was forced to grant religious toleration and to recognize Bethlen Gábor as ruler of half the kingdom. In 1626 Wallenstein took the field with a vast army which he had raised for the Emperor, whose main reliance in the war against the Protestants had hitherto been the army of the Catholic League, under Tilly, and the forces of Spain. In 1625 Christian IV. of Denmark took up arms for the German Protestants. The victories of Wallenstein and Tilly made the Catholic cause for the

King triumphant, and Denmark was forced to the Peace of Lübeck in 1629. This was followed by Ferdinand's Edict of Restitution, which was to apply to all ecclesiastical property which had become Protestant since the Peace of Passau (1552). But the plans of Ferdinand for reconverting the Empire to Roman Catholicism were suddenly checked by the irruption of Gustavus Adolphus, King of Sweden, in whom the Protestants found a deliverer. He landed in Germany in 1630, at the moment of the dismissal of Wallenstein through jealousy on the part of the Catholic League. Ferdinand had the mortification of seeing the whole of Germany overrun by the Protestants, and though Gustavus was slain at Lützen, in 1632, in a great battle against Wallenstein (who had been reinstated), the disasters to the Imperial cause continued. A blot on Ferdinand's character was the assassination of Wallenstein (q.v.) in 1634, to which there is little doubt the Emperor was privy. Though the Imperial army was victorious at Nördlingen, in 1634, and the Elector of Saxony made peace with the Emperor, yet when Ferdinand died, February 15, 1637, he left a heritage of war to his son, Ferdinand III., who had been chosen King of the Romans the year previous, and who had been previously crowned King of Hungary and Bohemia. Consult Hurter, *Geschichte Kaiser Ferdinands II. und seiner Eltern* (Schaffhausen, 1850-64). See AUSTRIA; GERMANY.

FERDINAND III. (1608-57). Holy Roman Emperor from 1637 to 1657. He was the son of Ferdinand II., and was born at Gratz, July 13, 1608. In 1625 he was crowned King of Hungary, and in 1627 of Bohemia as well. After the death of Wallenstein (1634), Prince Ferdinand was placed in nominal command of the Imperial forces, and in the same year, seconded by Gallas, he gained a great victory at Nördlingen over the Swedes and their allies. In 1636 he was crowned King of the Romans, and the next year succeeded his father as Emperor. Political reasons forced Ferdinand to continue the war, in which the French had become important factors, but in 1648, after negotiations extending over many years, the Peace of Westphalia (q.v.) put an end to the Thirty Years' War. In the Diet of that year, the last presided over by an emperor in person, Ferdinand effected important alterations in the administration of justice. He died April 2, 1657, shortly after concluding an alliance with Poland against Sweden. His son, Leopold I., succeeded him in the Empire, as well as in the Austrian possessions and Hungary. Consult Koch, *Geschichte des Deutschen Reichs unter Ferdinand III.* (Vienna, 1865-66). See AUSTRIA; GERMANY; THIRTY YEARS' WAR.

FERDINAND I., surnamed THE JUST (1379-1416). King of Aragon from 1412 to 1416. He was the younger son of John I. of Castile and Leonora of Aragon. On the death of his elder brother, Henry III., in 1407, he refused the crown of Castile, but undertook the office of regent during the minority of his nephew, John II. In this capacity he distinguished himself by his prudent administration of home affairs, and by his victories over the Moors by land and sea. He took the title *de Antequera* on the surrender of that fortress after a siege of five months (1410). On the death of his maternal uncle, King Martin of Aragon and Sicily, in 1410, his claims to the throne, though not derived through the usual laws of descent, were taken up and keenly pressed by a powerful party in the State. The question of the succession was ultimately referred to a committee of nine judges, equally representing Catalonia, Valencia, and Aragon, and the result was his election by a majority in 1412. After he had defeated Count Jaime of Urgel, the last and most formidable of his rivals, he was formally crowned at Saragossa in 1414. He died April 2, 1416, at Igualada, and was succeeded by his son, Alfonso V.

FERDINAND II. King of Aragon. See FERDINAND V. OF CASTILE.

FERDINAND I., *Ger. pron.* fĕr′dē-nänt (1793-1875). Emperor of Austria from 1835 to 1848. He was the eldest son of Francis I. by his marriage with Maria Theresa, of the House of Naples, and was born in Vienna, April 19, 1793. While Crown Prince he traveled through the Italian provinces of Austria, Switzerland, and part of France, and showed great interest in the various branches of industry. In 1830 he was crowned King of Hungary, and in 1831 married Anna, the daughter of Victor Emmanuel I., King of Sardinia. An unsuccessful attempt to assassinate him was made by a Captain Reinol in 1832. In 1835 he succeeded his father on the throne. It was expected that he would inaugurate a more liberal policy than that of his predecessors; but the absolutist principles triumphed, and Metternich was allowed to carry on the Government. A Council of State was formed and reactionary measures continued. Industrial and commercial activity was encouraged, however, and the term of military service reduced from fourteen to eight years. In 1846 advantage was taken of the insurrection in Galicia to annex Cracow to Austria. In March, 1848, Vienna became the scene of a revolutionary outbreak (see AUSTRIA-HUNGARY), and the Emperor was forced to dismiss Metternich, who fled from Vienna, and to appoint a responsible ministry. Simultaneously a revolutionary movement at Pesth secured the appointment of a national Hungarian ministry. In May Ferdinand retired with his Court to Innsbruck, but was induced to return to the capital in August, when the turmoil had subsided. But the October insurrection in Vienna made him again leave the palace of Schönbrunn and retire to Olmütz, where, on December 2, 1848, he abdicated in favor of his nephew, Francis Joseph. He afterwards resided at Prague, where he died June 29, 1875. Consult Stiles, *Austria in 1848-49* (New York, 1852).

FERDINAND I., PRINCE OF BULGARIA (1861—). He was born in Vienna, the youngest son of Prince Augustus of Saxe-Coburg and Princess Clementine of Bourbon-Orleans, a daughter of Louis Philippe. While serving in the Hungarian Army he was offered in 1887 the vacant throne of Bulgaria, and on August 14, 1887, took the oath to the Constitution. Although highly acceptable to his subjects, he was not recognized by Turkey or the Great Powers until 1896. To cement the friendly relations with Turkey and Russia, Prince Ferdinand visited the Sultan in 1897 and the Czar the following year. See BULGARIA.

FER′DINAND I. (?-1065). King of Castile and Leon, surnamed The Great. He was the second son of Sancho III. of Navarre, and in 1033, when Sancho forced Bermudo III. of Leon, the last direct descendant of Pelayo, in the male line, to surrender Castile, Ferdinand received that kingdom, together with Bermudo's sister Sancha in marriage. Bermudo, shortly after Sancho's death, sought to recover his lost possessions, but was defeated and slain (1037). Ferdinand, now King of Leon as well as of Castile, by a conciliatory though firm policy, soon established his authority over his conquered subjects, and when in 1053 his domains were invaded by his brother, Garcia IV. of Navarre, the attack resulted in the death of the latter on the battlefield of Atapuerca, near Burgos, and the annexation of a large portion of his dominions. At an early period of his reign Ferdinand began to direct his energies against the Moors, and by a series of successful campaigns carried the Christian arms as far as the Mondego, and reduced the emirs of Toledo, Saragossa, and Seville to subjection. He died at Leon, on December 27, 1065, after having divided his dominions among his children. Ferdinand laid claim to the title of Emperor of Spain, a claim to which the Emperor Henry III. of Germany objected, appealing in 1055 to Rome. According to a very doubtful tradition, a decision favorable to Ferdinand's Imperial pretentions, so far as they related to the territories which had been conquered from the Moors, was given, chiefly in consequence of the representations made by the famous Cid, Ruy Diaz de Bivar. Ferdinand effected many reforms, both in secular and ecclesiastical matters, and was very liberal to the Church.

FERDINAND II. (?-1188). King of Leon from 1157 to 1188. The death of his brother, Sancho III. of Castile, in 1158, led to a military occupation of Castile by Ferdinand, professedly in the interests of his nephew, Alfonso VIII., but this occupation lasted only a short time. Meanwhile Ferdinand repudiated his wife, Doña Urraca, and became involved in a war with his father-in-law, Alfonso I. of Portugal, which resulted in the defeat and capture of the latter at Badajoz, in 1179. He died in 1188, and was succeeded by his son, Alfonso IX.

FERDINAND III. (1199-1252). A king of Castile and Leon, usually known as Saint Ferdinand. He was the son of Alfonso IX. of Leon, and of Berengaria, sister of Henry I. of Castile. On the death of Henry, without issue, in 1217, Berengaria procured the proclamation of Ferdinand. In 1230, on the death of his father, he became King of Leon as well as Castile, thus finally uniting the two kingdoms under one crown. Following up the advantages which had been gained for the Christian arms by his father and the allied kings in the great battle at Las Navas de Tolosa, in 1212, he devoted all his energies to the prosecution of the Moorish war. Among his conquests may be mentioned those of Ubeda, in 1235; of Cordova, in 1236; of Jaen, in 1246; and of Seville, in 1248. He was planning an invasion of Africa when he died at Seville, leaving his kingdom to his eldest son, Alfonso X. Though not canonized until 1677, he came to be popularly known as *el Santo* from a very early period, for his remarkable religious zeal. He laid the foundation of *Las Siete Partidas,* the legal code of Christian Spain, which was completed by Alfonso X. (q.v.).

FERDINAND IV. (1285-1312). King of Castile and Leon from 1295 to 1312. He was the son of Sancho IV. The early years of his reign were disturbed by a series of civil wars, but order was restored by 1302. Secure at last in possession of his throne, Ferdinand was free to pursue the traditional policy of war against the Moors; and in carrying it out he was aided by pecuniary grants from his own nobles and from Pope Clement V., as well as by the spoils of the Knights Templar, which accrued to him on the destruction of the Order. His chief exploit, as recorded by the historians, both Spanish and Arab, was the expedition against Algeciras in 1309, which, though unsuccessful in its main object, resulted in the capture of Gibraltar and other strongholds. In the course of a subsequent campaign he died suddenly, September 17, 1312. According to Mariana, he had condemned to death, unheard, two brothers of the name of Carvajal, and these, protesting their innocence, had summoned him to meet them within thirty days at the bar of God; hence the surname *el Emplazado*, 'the Summoned.' He was succeeded by his infant son, Alfonso XI.

FERDINAND V., surnamed THE CATHOLIC (1452-1516), King of Spain; as King of Castile, Ferdinand V.; as King of Aragon, Ferdinand II.; as King of Naples, Ferdinand III. He was the son of John II., King of Aragon, and was born March 10, 1452. In 1469 he married, at Valladolid, Isabella, sister of Henry IV. of Castile. On the death of Henry, in 1474, the Cortes proclaimed Isabella and her husband joint sovereigns of Castile and Leon. In 1479 Ferdinand became King of Aragon and Sicily, on the death of his father, and the two kingdoms of Aragon and Castile were united in the persons of Ferdinand and Isabella. Isabella, however, as long as she lived, maintained her position as Queen of Castile, and allowed her husband no other share in the Government than the privilege of affixing his signature to the decrees and of uniting his arms with her own. Nevertheless, his influence in developing the Spanish monarchy was of capital importance. Ferdinand's reign was marked by uniform good fortune in his wars and his diplomacy. In Castile he distinguished himself by the effectual suppression of the banditti, who had become formidable in the confusion resulting from the civil wars. This he accomplished by reorganizing and putting in force against them the Hermandad, or Holy Brotherhood, a kind of national militia, representing all the cities of Spain. Not content, however, with taking strong measures against the Castilian outlaws, he also resolved to break the power of the feudal nobility, and made good use of the Hermandad in carrying out this design. Cities and towns were encouraged to make themselves independent of the nobles, who were deprived of many important privileges. Among other humiliations, they were subjected to the ordinary tribunals of justice. The reorganization of the Inquisition in 1478-80, although primarily and mainly intended to further religious ends, likewise helped to lessen their influence. Ferdinand also strengthened his power by vesting in himself and his successors the grandmastership of the military orders of Calatrava, Alcántara, and Santiago. In all his schemes he was ably seconded by his Queen, Isabella, and by the celebrated Cardinal Ximenez. The year 1492 was the most brilliant in his reign, and is one of the most important in the history of the material progress of the world. It was signalized by the discovery of America by Christopher Columbus, though the honor of having aided the great navigator belongs, not to Ferdinand, but to Isabella. The beginning of the same year witnessed the entry of Ferdinand and Isabella into Granada and the end of Moorish dominion in Spain. This event was immediately followed by the expulsion of the Jews from the Spanish dominions and from Sicily. This act of barbarity entailed the loss of a large and industrious body in the community. Ferdinand was as successful abroad as at home. He was victorious over Alfonso V., King of Portugal, while his general, Gonsalvo de Cordova, decided the contest for the possession of the Kingdom of Naples between France and Aragon in favor of the Spaniards in 1503. In the following year Isabella died, but Ferdinand regained power after 1506 as Regent of Castile for his daughter, Juana the Mad (who had married Philip, son of the Emperor Maximilian), and her son Charles. In 1505 Ferdinand married Germaine de Foix, a niece of Louis XII. of France. He took part in the famous League of Cambrai, formed against Venice in 1508, made himself master of various towns and fortresses in Africa, and in 1512 conquered the main portion of the Kingdom of Navarre, thus becoming monarch of Spain from the Pyrenees to the Rock of Gibraltar. He died at Madrigalejo, January 23, 1516, and was succeeded by his grandson, Charles I. (afterwards Holy Roman Emperor as Charles V.). To Ferdinand and Isabella Spain owes her unity and greatness as a nation. Consult: Prescott, *Ferdinand and Isabella* (Philadelphia, 1900).

FERDINAND VI. (c. 1712-59). King of Spain from 1746 to 1759, called 'The Sage.' He was the third son of Philip V. and Maria Louisa of Savoy. On succeeding to power he withdrew from European complications, concluding the Peace of Aix-la-Chapelle (1748), and devoted himself to internal reforms in his kingdom, aided by his two able ministers, Carvajal and Ensenada, and by his Irish adviser, Wall. Financial, agricultural, and commercial reforms took place, and the arts were encouraged by the foundation of the Royal Academy of San Fernando and by State support for the higher education of Spanish students. In 1753, by a concordat with Pope Benedict XIV., the right of presentation to Spanish benefices was confined to the King for all save fifty offices. In the Seven Years' War Ferdinand refused to join the French and the English, and remained neutral. In 1758 the King, who had never enjoyed good health, broke down almost completely after the death of his consort, Maria of Portugal, and lost his reason. Under these circumstances a regency was formed. He died at the monastery of Villaviciosa, August 10, 1759. As he left no heirs, the crown passed by an act of settlement to his half-brother, Charles III. Consult: Coxe, *Memoirs of the Kings of Spain of the House of Bourbon* (London, 1815); Villa, *Marqués de la Ensenada* (Madrid, 1878).

FERDINAND VII. (1784-1833). King of Spain 1808 and 1814 to 1833. He was the son of King Charles IV., and was born at San Ildefonso, October 14, 1784. In 1789 he was proclaimed Prince of Asturias, and his education was intrusted to the Duke of San Carlos and the Canon Escoiquiz. Encouraged by them, he placed himself in opposition to the powerful Spanish Minister, Manuel de Godoy (q.v.), who, after the death of Ferdinand's first wife, Marie Antoinette Therèse of Naples, in 1806, sought to marry the young Prince to Marie Therèse de Bourbon. Upon this Ferdinand took the advice of the French Ambassador, Beauharnais, and wrote to Napoleon asking for the hand of one of the Emperor's nieces. Spanish spies, acting on behalf of Godoy and the Queen, unearthed this correspondence, and the Prince was arrested by order of Charles IV. and confined in the Escorial in 1807. These events were followed by the French invasion of Spain, which so inflamed the people against Godoy and the King and Queen that they were forced to flee from Madrid. In March, 1808, following on the rising at Aranjuez, Charles IV. abdicated in favor of Ferdinand, who was immediately proclaimed as Ferdinand VII., amid great rejoicing. The French, under Murat, however, entered Madrid a few days later, and Charles IV., instigated by the French, withdrew his abdication, in a letter to Napoleon, on the ground that it had been extorted from him. The Emperor thereupon invited Ferdinand VII. to a conference at Bayonne, and in spite of warnings the new King repaired thither, only to find himself a prisoner. The disorder in Madrid consequent on Murat's occupation was laid at Ferdinand's door, and after repeated negotiations and threats the Prince signed one paper renouncing the throne in favor of his father, and another by which he ceded to Napoleon all his rights of succession to the Spanish monarchy. In return, he was to receive a pension of 800,000 francs and the château of Valençay. There he remained for the next six years, with his uncle, Don Antonio, and his brother, Don Carlos.

In 1813, after Wellington's victorious campaign in the Peninsula, Napoleon offered to reinstate Ferdinand on the Spanish throne. In March, 1814, the long-wished-for sovereign returned, and was received with every demonstration of loyalty. All acts promulgated during his absence, including the Constitution of 1812, were abrogated, and the old order of things restored. For six years Ferdinand sought to make himself absolute. Banishment, imprisonment, and death were all resorted to; but insurrection succeeded insurrection, until in 1820 such a serious mutiny took place among the Spanish troops, supported by the Cortes and the people, that Ferdinand was forced to confirm the Constitution of 1812. But the struggle between the Constitutionalists and Royalists continued, and finally ended in the triumph of the former (1822); thereupon the Holy Alliance sent a French army in 1823 to restore peace and absolutism, which, after an obstinate resistance on the part of the liberal element, it succeeded in doing. The Cortes, after the occupation of Madrid, retired to Cadiz, but were unable to hold the place against the invaders. Ferdinand returned in triumph to Madrid, and his first act was to annul all liberal measures passed since 1820 as having been forced upon him. The Absolutist and Clerical party became practically supreme. In 1829 Ferdinand married his fourth wife, Maria Christina of Naples, and in 1830 abolished by a Pragmatic Sanction the Salic law as regarded female succession to the Spanish throne. This deprived his brother, Don Carlos, of the succession, by making the Infanta Isabella (born 1830) eligible to the throne, and led to the formation of the Carlist party in Spain. Through the influence of Calomarde (q.v.), Ferdinand was induced to revoke the Pragmatic Sanction of 1830, but soon after recalled his action and reaffirmed the succession of Isabella. In 1833 Isabella was proclaimed Princess of Asturias and heiress to the throne. Three months later (September 29, 1833) Ferdinand died at Madrid, leaving his Queen, Maria Christina, regent. His reign was a most disastrous one for Spain, which lost almost all its possessions in North and South America, and passed through vicissitudes and misfortunes that drained it of its best citizens and from which it has never recovered. Consult: Seignobos, *Political History of Europe Since 1814*, translated by Macvane (New York, 1900); also *España del siglo XIX.*, by various authors (Madrid, 1886-87); Baumgarten, *Geschichte Spaniens von 1789* (Leipzig, 1865-71). See SPAIN.

FERDINAND I. (c. 1423-94). King of Naples from 1458 to 1494. He was an illegitimate son of Alfonso V. of Aragon. He succeeded his father on the throne of Naples in 1458, but found an enemy in Pope Calixtus III., who favored John of Anjou. The latter invaded the kingdom and defeated Ferdinand. Pius II., the successor of Calixtus, supported him, however, and, with the assistance of Scanderbeg, the famous Albanian chief, John was defeated with great loss in August, 1462. In 1480 the Turks captured Otranto and slaughtered most of the inhabitants, but in the next year they were driven out. In 1485 a number of nobles revolted. Ferdinand held out the promise of a general amnesty if they would make submission, and then treacherously murdered them. He died just as Charles VIII. of France was about to invade his dominions. Though tyrannical, cruel, and treacherous, Ferdinand fostered industry and commerce, and invited many humanists to his Court, establishing a printing-press at Naples in 1474.

FERDINAND II. (1469-96). King of Naples from 1495 to 1496. He was the grandson of Ferdinand I., and son of Alfonso II., who abdicated in his favor in 1495. The kingdom was invaded by Charles VIII. of France, and Ferdinand fled. With the aid, however, of Gonsalvo de Cordova, the great general of Ferdinand V. of Spain, he drove out the French invaders a short time before his death.

FERDINAND III. King of Naples. See FERDINAND V. OF CASTILE.

FERDINAND I. (1345-83). King of Portugal from 1367 to 1383, son of Pedro I. His reign was spent in fighting to obtain Castile for himself, and later for John of Lancaster, to the great loss of Portugal. Ferdinand died in 1383, and in 1385 an illegitimate son of Pedro I., John, founder of the dynasty of Aviz, was proclaimed King.

FERDINAND I. (1751-1825). King of the Two Sicilies from 1759 to 1825. He was the third son of Charles III. of Spain, and was born at Naples, January 12, 1751. When Charles ascended the Spanish throne, in 1759, Ferdinand succeeded him in Naples and Sicily under a regency of which the progressive minister Tanucci was the head. Many reforms were inaugurated, and in 1767 the Jesuits were expelled from the kingdom. In 1768, after attaining his majority, the young King married Carolina Maria, a daughter of Maria Theresa of Austria, who was given a voice in the royal council after the birth of an heir, and soon undermined the influence of Tanucci, who was dismissed in 1777. An Englishman, Sir John Acton, succeeded him in favor, and became virtually Prime Minister. Ferdinand was led to join England and Austria against France in 1793, but was glad to make peace with the Directory in 1796. In 1798, however, he joined the secret alliance of Russia, Austria, and England, and his army occupied Rome. Ferdinand was no warrior and sadly lacked personal courage, for as soon as the French appeared and attacked his forces he fled to Naples, and, embarking in an English man-of-war, escaped to Palermo. Naples was entered by the French, who, aided by a party of the nobles and citizens, established the short-lived Parthenopean Republic. The lower classes, who had fiercely opposed the French, were hostile to the new régime, and this, combined with reverses in northern Italy, led the French army to withdraw. The Republic collapsed before Cardinal Ruffo's Calabrian forces, and Ferdinand was restored. A reign of terror was immediately inaugurated, and the republicans suffered greatly, but could do nothing in the presence of an English fleet under Nelson and a Royalist army. Relief came in 1801, when Ferdinand was forced to sign a treaty with France which included, besides various concessions, a general amnesty to political offenders, and a clause allowing French troops to occupy his dominions. In 1805, at the instigation of Queen Caroline, he joined the Third Coalition, and permitted 13,000 Russian and English troops to disembark at Naples. Napoleon won the victory of Austerlitz, and a French army forced the King and Queen of Naples to take refuge in Sicily. Naples was handed over to Joseph Bonaparte, and later to Murat (1808), and it was not until 1815 that Ferdinand was restored. He had ruled over Sicily, however, under the title of Ferdinand III., until 1812, when he resigned his authority to his son Francis, under pressure from England, after granting the Sicilians a liberal constitution. After his restoration Ferdinand united the kingdoms of Sicily and Naples, and assumed the title by which he is generally known—Ferdinand I., King of the Two Sicilies. Although he granted the Neapolitans a constitution as a condition of his recall, he speedily abolished it when firmly established. His tyrannical policy brought on the revolution of 1820, and he was forced to relinquish his authority to his son, who was named Viceroy, and to swear to observe the liberties of the people. At the Congress of Laibach, in the same year, however, he succeeded in securing Austrian aid, and entered Naples in triumph in 1821, with an Austrian force at his back. Aided by his unscrupulous minister, Canosa, Ferdinand took a cruel vengeance on his subjects. The system of espionage and arrest was continued under Canosa's successor, Medici, becoming worse each day. Ferdinand died suddenly January 4, 1825, and was succeeded by his son, Francis I. For a good account of Ferdinand's reign, consult: Colletta, *Storia del reame di Napoli dal 1734 sino al 1815*, Eng. translation (Edinburgh, 1858); Lanzilatti, *Memorie storiche di Ferdinando I.* (Naples, 1827); Jeaffreason, *The Queen of Naples and Lord Nelson* (London, 1889); Probyn, *Italy, 1815-78* (London, 1884).

FERDINAND II. (1810-59). King of the Two Sicilies from 1830 to 1859, known as 'King Bomba.' He was the son of Francis I. by his second wife, Isabella Maria of Spain, and was born January 12, 1810. On succeeding his father in 1830, he found the country in the most wretched condition. The beginning of his reign was marked by specious promises of reform in the economy and government of the country. But Ferdinand soon began to listen to Austrian counsels, which saw danger for the whole peninsula in liberal measures. From that time Naples became the scene of incessant conspiracy, revolution, bloodshed, and political prosecutions. The King was aided by his infamous minister of police, Delcarreto, and an elaborate system of espionage was established. The Jesuits overran the kingdom and dominated ecclesiastical affairs. After insurrections had taken place in 1837, 1841, 1844, and 1847, Ferdinand was forced to yield to the storm of 1848, and granted a constitution to both parts of his dominions. After following the Constitution so far as to call the Chambers together, he quarreled with the Deputies, and on March 13, 1849, dismissed them, impatient of any interference with his authority. An insurrection which had broken out in Sicily was put down by a ruthless bombardment of Messina, an incident which earned for the King the name of Bomba. After the subjugation of Sicily he hastened completely to set aside the new Constitution, while all who had taken any part in the agitation for reform were subjected to cruel persecution. In 1851 there were 13,000 political prisoners confined at Naples. Both France and England made strong representations in 1856, but in vain. Several attempts to assassinate Ferdinand failed, but in 1858 he was forced by Great Britain to liberate the political prisoners. Ferdinand died May 22, 1859, after terrible suffering, and was succeeded by his eldest son, Francis II. Consult: Nisco, *Ferdinando II. ed il suo regno* (Naples, 1884); Dawburn, *Naples and King Ferdinand* (London, 1858); Thayer, *The Dawn of Italian Independence* (Boston, 1893); Stillman, *The Union of Italy* (Cambridge, 1898).

FERDINAND I. (1549-1609). Grand Duke of Tuscany, a member of the House of Medici. He became Cardinal at the age of fourteen, and after the death of his brother in 1587 succeeded to the rule of the grand duchy. He favored the extension of commerce and of public works, and continued the construction of the harbor of Leghorn, begun by his father. He cultivated excellent relations with the other States of Italy, and permitted the descendants of the Jewish refugees from Spain to settle in his realm. Owing to his numerous successful financial enterprises, he eventually became the leading capitalist of Europe.

FERDINAND II. (1610-70). Grand Duke of Tuscany. He was a son of Cosimo II., whom he succeeded in 1621, becoming of age in 1628. He soon fell under the influence of Spanish politics. In 1642-44 he formed an alliance with Venice, Parma, and Modena, against the Papal States, and conducted a disastrous war which imposed heavy obligations on the people.

FERDINAND III. (1769-1824). Grand Duke of Tuscany, and Archduke of Austria. He was the second son of the Emperor Leopold II., and was born at Florence, May 6, 1769. In 1790 he succeeded his father in the government of Tuscany, when the latter became Emperor through the death of Joseph II. A lover of peaceful progress, he remained strictly neutral in the first coalition against France, and was the first sovereign in Europe to recognize the French Republic, in 1792. In 1793, intimidated by the combined menaces of the Russian and British cabinets, the Grand Duke was constrained to relinquish his neutral policy, and to become a passive member of the coalition against France. In 1795, on the French occupation of Piedmont, he speedily reassumed friendly relations with France. In 1797, in order to save his State from annexation to the Cisalpine Republic, he concluded a treaty with Bonaparte on the most unfavorable terms, undertaking to pay a war levy to France, and to transfer to the Museum of Paris some of the chief masterpieces of the Florentine galleries. Owing to the continued intrigues of France in his State, Ferdinand was forced to seek an Austrian alliance, which furnished Bonaparte with a pretext for declaring war against Tuscany. In 1799 Ferdinand had to retire to Vienna, and in 1801, at the Peace of Lunéville, he was forced to renounce all claims on Tuscany, receiving the title of Elector and the principality of Salzburg (1803), which after the Peace of Pressburg, in 1805, he exchanged for the Duchy of Wurzburg. He was one of the princes in the Confederation of the Rhine (q.v.), and in 1814 was reinstated in his Grand Duchy of Tuscany by the Peace of Paris. In coöperation with his chief minister, Fossombroni, he reformed the institutions of the grand duchy, and enjoyed ten years of prosperous rule. He died June 7, 1824, leaving his State to his only son, Leopold II. Consult: Thayer, *Dawn of Italian Independence* (Boston, 1893); Inghirami, *Storia della Toscana* (Fiesole, 1843); Reumont, *Storia della Toscana sotto la dinastia di Lorena-Absburgo* (Florence, 1877); Tivaroni, *Italia durante il dominio austriaco* (Milan, 1892-94).

FERDINAND IV. (1835—). Grand Duke of Tuscany. He was born in Florence, a son of Leopold II. and of Maria Antonia, daughter of Francis I., King of the Two Sicilies. After his father had renounced the throne (July 21, 1859), Ferdinand assumed the title of Grand Duke, and on March 26, 1860, issued a protest against the incorporation of Tuscany with Sardinia.

FERDINAND (1577-1650). Duke of Bavaria, and Elector of Cologne. He was born at Arnsberg, and was educated by the Jesuits at the University of Ingolstadt. After the death of his uncle (1612), whose coadjutor he had become in 1595, he was appointed his successor as Elector of Cologne. He also obtained the bishoprics of Liège, Münster, and Hildesheim, to which, in 1618, Paderborn was added. He was an enthusiastic disciple of the Jesuits, and zealously strove to exterminate heresy.

FERDINAND (1721-92). Duke of Brunswick and Prussian field-marshal, a son of Ferdinand Albert II. (q.v.). He was born at Wolfenbüttel, one of a family of fourteen children. After a journey through the Netherlands, France, Italy, and Austria, he entered the Prussian service in 1740 as colonel, served on the staff of Frederick the Great during the first Silesian War, and afterwards remained the companion of the King. Subsequently appointed major-general, he served as commander of the foot-guards in the Silesian campaign of 1745, when he greatly distinguished himself at the battle of Hohenfreidberg. He was one of the most skillful commanders during the Seven Years' War, his most notable achievements being his victories over the French at Crefeld (1758) and Minden (1759). He was noted for his patronage of science and art, and for his numerous charities.

FERDINAND (1816-85). Titular King of Portugal. He was born at Vienna, October 29, 1816, the eldest son of Ferdinand, Duke of Saxe-Coburg-Gotha. In 1836 he married Donna Maria da Gloria, Queen of Portugal. He received the title of King the next year, and after the death of the Queen, in 1853, he acted as regent till 1855, during the minority of his son Pedro V. In spite of his foreign extraction Ferdinand was very popular in Portugal. In 1869 he was offered the Spanish crown by an influential delegation, but he wisely refused. The same year he made a love marriage with the celebrated American vocalist, Eliza Hensler, whom he created Countess of Edla. The rest of his life was spent in retirement. He devoted himself to painting and engraving with considerable success. He died in Lisbon, December 15, 1885. Of the three sons of his first marriage, two, Pedro and Louis, became Kings of Portugal. Consult: Geidraye, *Résumé de l'histoire du Portugal au XIXème siècle* (Paris, 1875); also *Memoirs of the Duke of Saldanha* (London, 1880).

FERDINAND OF PORTUGAL (1402-43). A prince of Portugal called the 'Holy Prince,' the sixth son of King John I. He took part in the expedition against Tangiers, under the leadership of his brother Henry (1437). Upon its defeat Ferdinand was left as hostage in the hands of the King of Fez for the city of Ceuta, which Henry had promised as ransom. King John and the Cortes refused to yield it, and Ferdinand dragged out a slavery of six years. His bones were brought back to Portugal, and he was canonized in 1470.

FERDINAND, *Ger. pron.* fĕr'dê-nänt, VICTOR ALBERT MAINRAD (1865—), Prince of Rumania. He was born at Sigmaringen, Prussia, the second son of Prince Leopold of Hohenzollern, elder brother of King Charles I. of Rumania. After his father and his elder brother had renounced their title to the crown (November 22, 1888), he was declared heir presumptive. In 1889 he became Senator, and on March 18, 1889, was formally invested with the title of Prince of Rumania, and pronounced by the King and the legislative assembly the successor to the throne. On January 10, 1893, he married Maria, the eldest daughter of the Duke of Edinburgh.

FERDINAND ALBERT II. (1680-1735). Duke of Brunswick. He was a son of Ferdinand Albert I. (1638-87), first Duke of Brunswick-Bevern. During the War of the Spanish Succession he fought with the Imperial army in Württemberg and Bavaria, and in 1711 became lieutenant-general. He fought in the Turkish wars in the army of Prince Eugène, and distinguished himself at Temesvár and Belgrade. As field-marshal of the Empire (1733) he conducted the army from Pilsen to the Rhine, and subsequently took part in the operations there. He became Duke of Brunswick-Wolfenbüttel March 1, 1735, the year of his death. He was a particular favorite with King Frederick William I. of Prussia.

FERDINAND WILLIAM (1659-1701). Prince of Württemberg-Neustadt. He was educated in mathematics and military science, and after serving in Denmark entered the Imperial army, and fought with distinction against the Turks and the French. In 1690 he commanded the auxiliary Danish troops in the campaign against Ireland. He subsequently led the same troops to Holland, where he distinguished himself in the conflicts with the French at Steenkerk and Neerwinden, and became general of infantry. In 1698 he entered the service of King Augustus the Strong of Poland and defeated the Turks in the Ukraine, compelling them to cede to Poland a portion of Podolia.

FER'DINAND. (1) The son of the King of Naples in Shakespeare's *Tempest.* By the magic of his uncle Prospero he is shipwrecked on the enchanted isle, where he falls in love wth Miranda. (2) The King of Navarre in Shakespeare's *Love's Labour's Lost.* (3) The Count of Calabria in Webster's *Duchess of Malfi.* He murders his sister, the title-character, because he thinks her false to family traditions.

FERDINAND AND ISABEL'LA, HISTORY OF THE REIGN OF. A work by William H. Prescott, published in 1837.

FERDINAND, COUNT FATHOM, THE ADVENTURES OF. The third of Smollett's novels (1753). It is a satire against the prevalence of brutality, and contains a famous scene in a robber's hut in the Black Forest.

FERENTINO, få'rĕn-tē'nô. A city in the Province of Rome, Italy, 1450 feet above the sea, 50 miles southeast of Rome (Map: Italy, H 6). Enormous blocks of stone and a gateway on the west mark the course of the walls of the ancient Ferentinum, a town of the Hernici colonized by the Romans. The town markets wine and oil, and has a seminary, a gymnasium, and a cathedral paved with ancient marbles and mosaics. Population, in 1901 (commune), 12,279.

FERENTO, få-rĕn'tô. A ruined city in central Italy, five miles north of Viterbo. It is near the site of the ancient Ferentinum, originally an Etruscan city. There are extensive Etruscan, Roman, and mediæval remains of walls, baths, and a huge theatre.

FERGHANA, fĕr-gä'nå. A territory (*oblast*) of Russian Turkestan, Central Asia, situated between East Turkestan, the Pamir, Bokhara, and the remainder of Russian Turkestan (Map: Asia, G 5). Its area is approximately 35,500 square miles. With the exception of the central portion, which forms the valley of the Upper Sir-Daria, the surface of Ferghana consists both of mountains and steppes. The Alai and Trans-Alai Mountains traverse it in the south. The larger part of the country is barren and unfit for cultivation. The climate is hot and the rainfall insufficient. The chief rivers are the Sir-Daria and the Kizil-Su. Lake Kara Kul is situated in Ferghana. The agricultural land is found mostly along the Sir-Daria, where cereals and fruit are raised to some extent. Silk, for which Ferghana was especially known, is still cultivated, being greatly favored by the Russian Government. The region is rich in minerals, including coal, lead, graphite, and petroleum. The last is exploited to some extent. The manufacturing industries of Ferghana are of considerable importance, although most of them are carried on as house industries. In 1895 there were over 70 large industrial establishments with an annual output valued at more than $4,000,000. The leading manufactures are cotton, leather, silk, rugs, etc. The trade is chiefly with Russia, Bokhara, and East Turkestan. In 1895 the total value of the trade amounted to over $16,000,000. There are over 130 miles of railway line in the territory, connecting it with Samarkand and Bokhara.

The population of the territory in 1897 was 1,560,400, of whom the larger part were Sarts, and the rest Kirghizes, Tajiks, Russians, Jews, etc. The capital is Khokand. Ferghana constituted a part of the Sogdiana of the Greeks. It was invaded by the Arabs during the eighth century, and was under the rule of the Samanids for two centuries thereafter. Conquered successively by a number of Oriental rulers, including Timur, the country obtained its independence at the end of the eighteenth century, when it was known as the Khanate of Kokand, or Khokand, the territory of the khanate being then considerably larger than the present territory of Ferghana. Internal dissensions gave the Russians an opportunity for interference, and in 1876 the khanate was annexed to Russia under the name of Ferghana.

FER'GUS. A town of Wellington County, Ontario, Can., on Grand River, 10 miles north of Guelph. It has manufacturing industries, and is a railway junction of branch lines of the Canadian Pacific and the Grand Trunk railways. Population, in 1891, 1598; in 1901, 1396.

FERGUS FALLS. A city and the county-seat of Otter Tail County, Minn., 187 miles northwest of Minneapolis, on the Red River, and on the Great Northern and the Northern Pacific railroads (Map: Minnesota, C 4). It is in the 'park' region of the State, the centre of a productive agricultural and lumbering section, and has abundant water-power. The manufactures include flour, woolen goods, wagons, sleighs, undertakers' supplies, foundry and machine-shop products, sash and doors, brooms, beer, etc. There is a public library. A State hospital for the insane and the Park Region Lutheran and Northwestern colleges are situated here. Fergus Falls, chartered as a city in 1863, is governed under the charter of that date, which provides for a mayor, annually elected, and a city council. The electric-light plant is owned and operated by the municipality. Population, in 1890, 3772; in 1900, 6072.

FER'GUSON, Adam (1723-1816). A Scottish philosopher and historian. He was born at Logierait, Perthshire, where his father was parish minister; studied at the universities of Saint Andrews and Edinburgh, and in 1745 was appointed chaplain to the Forty-second Regiment, in which capacity he was present in the battle of Fontenoy, and is said to have charged the enemy sword in hand, among the foremost of the regiment. In 1757 he succeeded David Hume as keeper of the Advocates' Library in Edinburgh. The same year he took a great interest in the success of the tragedy of *Douglas*, written by his friend John Home, and wrote in its defense *The Morality of Stage Plays* (1757), which brought him into considerable notice. He was appointed professor in Edinburgh University first of natural philosophy, in 1759, and subsequently (1764) of moral philosophy. The year after he published his *Essay on the History of Civil Society.* He then devoted some time to collecting material for a Roman history, but his work was interrupted by travel on the Continent with the young Earl of Chesterfield in 1774-76, and in 1778 by his duties as secretary to the commission sent out by Lord North to try to arrange the disputes between the North American Colonies and England. In 1783 appeared his chief work, *The History of the Progress and Termination of the Roman Republic* (3 vols.). It is a carefully written narrative of the history of the Roman people during five hundred years. Two years later ill health forced Ferguson to give up his professorship, and in 1792 he published his academic lectures under the title of *Principles of Moral and Political Science.* His *Institutes of Moral Philosophy* (1772) has been used as a text-book in several foreign universities. Consult the biographical sketch by John Small (1864).

FERGUSON, James (1710-76). A Scottish astronomer, born near Keith, a village in Banffshire. Of humble origin, he enjoyed only three months of instruction at school, and his subsequent acquirements were the result of his own ardent desire for knowledge. After being employed in keeping sheep and drawing, he supported himself and his parents by making portraits, first in Edinburgh, and afterwards (1743) in London, his leisure time being devoted to astronomical pursuits. In 1748 he began to deliver popular lectures on astronomy and mechanics with considerable success, a feature of his lectures being the remarkable apparatus of his own construction, which he used for purposes of illustration. He was elected a fellow of the Royal Society in 1763, and received from George III. a pension of £50. He now gave up portrait-painting and devoted himself to lecturing and writing on his favorite scientific subjects. Few men in Europe did more to promote a knowledge of the results of science among those who did not have the advantage of regular scientific training. His principal works are: *Astronomy Explained Upon Sir Isaac Newton's Principles* (1756; Sir David Brewster's ed., 2 vols., 1811); *Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics* (1760), also edited by Sir David Brewster in 1805; and *Select Mechanical Exercises*, with an autobiography (1773). Consult Henderson, *Life of James Ferguson, F.R.S.* (London, 1867).

FERGUSON, James (1797-1867). An American astronomer and civil engineer. He was born in Perthshire, Scotland, but in 1800 was brought by his father to New York. He was engaged, as assistant engineer, on the construction of the Erie Canal in 1817-19; was assistant surveyor in the boundary commission appointed in accordance with the Treaty of Ghent from 1819 to 1822, and was astronomical surveyor of this commission from 1822 to 1827. From 1833 to 1847 he was first assistant in the United States Coast Survey, and from 1847 until his death was assistant astronomer of the United States Naval Observatory. He discovered several asteroids, and was a frequent contributor to scientific and other magazines.

FERGUSON, Patrick (1744-80). An English soldier, and inventor of the first practical breech-loading rifle. He was born in Scotland, and was educated at a military academy in London. Before he was fifteen years old he was appointed coronet in the Royal North British Dragoons, or Scots Greys, and served with them in the German campaign. The skill of the American marksmen during the first year of the Revolutionary War prompted him to devise several new forms of breech-loading firearms. In the first the breech was closed by a vertical screw-plug, which was lowered to admit the introduction of the ball, followed by the cartridge or charge; in the second, the breech was closed by a perpendicular or horizontal turnplate; and in the third, a sliding transverse-bar was used. Ferguson was ordered to America, where, early in 1777, he formed a corps of riflemen, consisting of volunteers from British regiments, armed them with breech-loading rifled carbines with screw-plug action, and sighted for 100 to 300 yards. The corps distinguished itself at the battle of Brandywine (September 11, 1777), but was afterwards disbanded by Sir William Howe because he had not been previously consulted as to its formation. Ferguson subsequently played a conspicuous part in the war in the Carolinas, but was ultimately defeated and killed in the engagement at King's Mountain, S. C. (October 7, 1780).

FERGUSON, Robert (?-1714). A British political writer and pamphleteer, known as the 'Plotter.' He was born in Scotland, was probably educated at the University of Aberdeen, entered the ministry, and held a living in Kent, from which in 1663 he was expelled by the Act of Uniformity. The Shaftesbury party in 1680 sought and secured his services as a writer of political pamphlets attacking the Government. He wrote pamphlets of remarkable ingenuity, attempting to prove the marriage of the King to Lucy Walters, the Duke of Monmouth's mother, and opposing the Exclusion Bill. He was implicated in 1683 in the Rye House Plot, although he afterwards asserted that he entered it only in order to frustrate it. He saved himself by fleeing to Holland. He accompanied Monmouth as his secretary and chief adviser on his expedition to the west of England in 1684, and after the battle of Sedgmoor, in 1685, escaped again to Holland. He accompanied William of Orange to England in 1688, and wrote various pamphlets in his behalf, but not receiving the recognition he had hoped for, suddenly became an ardent Jacobite, and was a party to most of the numerous plots during William's reign. He was several times arrested and imprisoned, but never brought to trial. Beside his religious and political pamphlets he wrote: *A History of the Revolution* (1706); *Qualifications Requisite in a Minister of State* (1710); *The History of All the Mobs, Tumults, and Insurrections in Great Britain* (1715). Consult Ferguson, *Ferguson the Plotter* (1887).

FERGUSON, Sir Samuel (1810-86). A British poet and antiquarian, born at Belfast, Ireland. He studied at Belfast, and afterwards went to Trinity College, Dublin, where he graduated in 1826. He practiced law for some time, and was then made deputy keeper of the public records of Ireland (1867). For his services in this difficult position, which entailed much research, he was knighted in 1878. His poems and stories appeared constantly in the *Dublin University Magazine,* and he was also a contributor to *Blackwood's Magazine.* In 1882 he was elected president of the Royal Irish Academy. It is said that his imperfect knowledge of the Irish language interfered with an entirely characteristic rendering by him of the ancient traditional material of the country; but many of his stories are very popular, especially *Father Tom and the Pope* (1838). His epic poem, *Congal,* in five books (1872), is probably his most important volume; other volumes are: *Lays of the Western Gael* (1865); *Poems* (1880). *Tales from Blackwood* (1st series, vols. iii., vii., viii., and xii.) contain several examples of his work. A collection of his stories and poems, including among the latter many early ones, was edited by Lady Ferguson, and called *Hibernian Nights' Entertainments* (1887). He also wrote several antiquarian studies, of which the best-known is *Ogham Inscriptions in Ireland, Wales, and Scotland,* edited by Lady Ferguson (1887).

FER'GUSSON, James (1808-86). A Scotch architectural writer. He was born at Ayr, and was educated at the high school in Edinburgh. He afterwards entered the firm of Fairlie, Fergusson & Co. at Calcutta, India. Having made a fortune in the indigo trade, he retired from business and devoted himself to the study of archæological and architectural subjects. In 1857 he was appointed a member of the Royal Commission to inquire into the defenses of the United Kingdom. He received a gold medal from the Royal Institute of British Architects in 1871, and was a vice-president of the Royal Asiatic Society at the time of his death. His important writings include *Illustrations in the Rock-Cut Temples of India* (1845); *The Illustrated Handbook of Architecture* (1855); *A History of Architecture in All Countries from the Earliest Times to the Present Day* (1867-76); *History of Eastern and Indian Architecture* (1876).

FERGUSSON, Robert (1750-74). A Scottish poet. He was born in Edinburgh, and was educated at the Dundee grammar school and at the University of Saint Andrews. Giving up the Church, for which he was at first intended, and refusing to study medicine, he returned to Edinburgh, where he found employment as a copyist in the office of the commissary clerk. This position he held, for the most part, till his death. His poems, which were contributed chiefly to *Ruddiman's Weekly Magazine,* gained him great local reputation. His society was eagerly sought, and in that convivial time he was led into excesses which impaired his health. He became melancholy, and, after a fall down a stairway, insane. In 1789 Burns placed over his grave a memorial bearing a verse epitaph. Fergusson, a fluent and natural versifier in the Scotch dialect, was the forerunner of Burns. Consult: *Works,* edited with *Life,* and *Essay on Poetical Genius* by Grosart (Edinburgh, 1851); and Ward, *English Poets,* vol. iii. (London and New York, 1889).

FERGUSSON, Sir WILLIAM (1808-77). An English surgeon. He was born at Prestonpans, Scotland, and was educated at Edinburgh. In 1831 he was elected surgeon of the Edinburgh Royal Dispensary, and after 1836 he served in the same capacity at the Royal Infirmary. He afterwards successively became professor of surgery at King's College, London (1840-70); surgeon in ordinary to the Prince Consort (1849), and to the Queen (1867); president of the Royal College of Surgeons (1870), and clinical professor of surgery at King's College (1870-77). He was for many years the leading operator in London, and was the inventor of numerous ingenious surgical instruments, such as the 'bulldog' forceps and the mouth-gag for cleft palate. He was especially successful with the operations for harelip and cleft palate, and for the amputation of limbs. His principal work is the *System of Practical Surgery* (5th ed. 1870).

FE′RIÆ (Lat., holidays). Holidays during which political and legal transactions were suspended in ancient Rome, and slaves enjoyed a cessation from labor. Feriæ were thus *dies nefasti,* the opposite of the *dies fasti.* (See FASTI.) Days which were consecrated to a particular divinity, on which any public ceremony was celebrated, and the like, were feriæ. In contradistinction to these, which were *feriæ publicæ* (public holidays), there were *feriæ privatæ,* which were observed by single families, in commemoration of some particular occurrence of importance to them or their ancestors. Birthdays, days of purification after a funeral, etc., were also observed as family feriæ. The public feriæ were divided into those which were always kept (*stativæ*) on certain days marked in the calendar, and those which were kept by command of the consuls or other superior magistrates on the occasion of any public emergency (*imperativæ*). There were forty-five fixed holidays in ancient Rome, and a large number of movable *feriæ,* the most important of which were the *feriæ latinæ,* the original common festival of the Latin tribes, held on the top of the Alban Mount, afterwards carried to Rome along with the supremacy over Latium; the *feriæ sementivæ* or sowers' festival, in the spring; and the *feriæ vindemiales,* or vintage festival, in the fall.

FERISHTAH, or **FIRISHTAH,** fē-rĕsh′tȧ, MOHAMMED KASIM HINDUSHAH (c. 1550-c. 1612). A Persian historian, born at Astrabad. Under commission from Ibrahim Adil Shah (1585-1628), he wrote the *Tarikh-i-Ferishtah,* a history of the Mahammedan dynasties of India from about the end of the tenth century, with an introduction on Indian history previous to Mohammedan dominion. This work is considered one of the most reliable of Oriental histories. It was translated into English by Dow (2 vols., 1768) and Briggs (4 vols., 1832).

FERLAND, fâr′läɴ′, JEAN BAPTISTE ANTOINE (1805-64). A Canadian clergyman and historian, born in Montreal. In 1828 he was ordained a priest of the Roman Catholic Church, and was made Vicar of Quebec. In 1847, while professor in the Seminary of Nicolet, he distinguished himself for his courage during an epidemic of typhoid fever. He was appointed professor of history in the Laval University in 1855. His reputation as an historian rests on his *Cours d'histoire du Canada* (vol. i., 1861; vol. ii. by Laverdière, 1865), in which an attempt is made to harmonize the confused accounts of the early settlers.

FERMANAGH, fẽr-măn′ȧ *or* fẽr-mä′nȧ (named from the Irish clan *Fir-Monach,* men of Monach). An inland county in the southwest of the Province of Ulster, Ireland (Map: Ireland, D 2). Area, 714 square miles. The chief towns are Fermanagh and Enniskillen. The population, chiefly engaged in agriculture, shows a gradual decline since 1841, when it was 156,850. In 1851 it was 116,400; in 1891, 74,170; in 1901, 65,240.

FERMAT, fâr′mȧ′, PIERRE DE (1601-65). A French mathematician, born at Beaumont-de-Lomagne, near Montauban. He was one of the most versatile mathematicians of his time, and was unsurpassed as a contributor to the theory of numbers. Fermat was educated privately, was of a retiring disposition, and published little during his lifetime. At one time he turned his attention to law, and in 1631 became counselor for the Parliament of Toulouse. The first edition of his works, gathered from his papers, annotations, and personal letters, was published in two volumes unter the title, *Opera Mathematica* (1670-79). Copies of this edition have become quite rare. The first volume contains the Arithmetic of Diophantus annotated, and the second, monographs on maxima and minima tangents, and centres of gravity, and copies of his correspondence with Huygens, Pascal, Descartes, and others. His chief contributions to the theory of numbers are found in his commentaries on Diophantus. Among them are such well-known propositions as follow: If a is prime to p, p being a prime number, then $a^{p-1}-1$ is divisible by p, or, expressed in the notation of congruences (q.v.), $a^{p-1}-1\equiv 0 \pmod{p}$. A prime greater than 2 can be uniquely expressed as the difference of two squares, p^2+q^2, where p is prime to q, is not divisible by a prime of the form $4n-1$. If p, q, r, are integers such that $p^2+q^2=r^2$, then pq cannot be a square. The equation $x^2+2=y^3$ has a unique solution, and the equation $x^2+4=y^3$ has two solutions. The equation $x^n+y^n=z^n$ has no integral root if n is integral and greater than 2. In the case of particular curves, Fermat obtained the maximum and minimum values of their functions; also the subtangents of the ellipse, cycloid, conchoid, and quadratrix. The methods employed so resembled those afterwards developed through the differential calculus that some mathematicians, especially Laplace and Lagrange, have suggested Fermat as the inventor of the calculus. The rise of the theory of probability (see PROBABILITY) may be dated practically from the correspondence of Fermat and Pascal (1654). Fermat's answers to the problems suggested by Pascal reveal his firm grasp on the fundamental principles of probabilities. For further information concerning the life and work of Fermat, consult: Libri, *Journal des savants* (1839, pp. 539-561); Brassinne, *Précis des œuvres mathématiques de Fermat* (Paris, 1853); Hoefer, in the *Nouvelle Biographie Universelle,* xvii., 438-51; Henry, "Recherches sur les manuscrits de Pierre de Fermat," in the *Bulletin, Boncompagni,* vols. xii. and xiii.; Paul Tannery, "Sur la date des principales découvertes de Fermat," in the *Bulletin Darboux,* 2d series, vol. vii. (1883); and "Les manuscrits de Fermat," in the *Annales de la Faculté des lettres de Bordeaux.* The *Œuvres* of Fermat were republished by Tannery and Henry under the auspices of the Minister of Public Instruction (Paris, 1891-94).

FERMATA, fĕr-mä′tȧ (It., stopped). In music, the name given to a pause or resting-point, generally marked by the sign 𝄐. The notes over which this sign is placed are prolonged beyond their true length.

FERMENTATION (from Lat. *fermentare,* to ferment, from *fermentum,* yeast, from *fervere,* to boil). A term applied to the decomposition of certain carbon compounds by the action of living organisms, either directly or by means of enzymes which they secrete. When the substances decomposed contain nitrogen and sulphur (e.g. proteids), ill-smelling gases may be evolved. Such fermentations are usually distinguished as putrefaction. A great variety of carbon compounds are fermentable, but carbohydrates and proteids are most notably so. The term was first applied to the decomposition of dissolved sugars into alcohol and carbon dioxide, the latter rising in bubbles through the liquid; the production of gases, though characteristic, is not, however, essential to fermentation.

Fermentations are often named from the principal product, e.g. alcoholic, lactic, butyric, acetic, etc. The products of fermentations are very numerous and diverse. From carbohydrates are derived various alcohols (ethyl, propyl, butyl, and amyl alcohol, mannite, glycerin) and organic acids (butyric, lactic, acetic, propionic, oxalic, citric, succinic, valerianic, formic, carbonic). From proteids arise ammonia, amido-acids, leucin, tyrosin, skatol, and aromatic substances, mercaptans, hydrogen sulphide, marsh gas, carbon monoxide, nitrogen, hydrogen, etc. Not all of these substances are produced by any one fermentation or from any one substance; indeed, the products vary from time to time in the course of fermentation, since the substances already formed, or the partial exhaustion of fermentable substances of a certain kind, affect the process.

The protoplasm of all plants is capable of causing fermentation. In the higher forms, however, this power is confined ordinarily to digestive processes, but extraordinary changes occur when the plant is deprived of oxygen for respiration. Then the protoplasm seems capable of decomposing itself and thus setting free energy sufficient to tide over the period of oxygen-starvation, provided this does not last more than a few hours. This process has been inaptly called intramolecular respiration. Noteworthy alcoholic fermentation ensues when the protoplasm of ripening fruits and seeds and the dying tissues of cut and crushed plants are deprived of oxygen, as in the making of ensilage. It has lately been shown that fermentation is in these cases often due to an enzyme, zymase, secreted by the protoplasm. The most active fermentations are produced by the simpler organisms, the bacteria (q.v.) and the lower forms of fungi (q.v.), especially the yeasts and mucors. The fermenting power of these organisms is so conspicuous that they were formerly called 'organized ferments' to distinguish them from enzymes. But the causes of the fermenting power of these lower plants are really the same as those above described for the higher plants, though in the latter it is less striking, because the conditions for its exercise occur more rarely. Some of the ferment organisms are adapted to live wholly without oxygen for respiration, securing the necessary energy by fermenting the medium in which they live; such, for example, are the butyric ferments (*Bacillus amylobacter*). Others are able to utilize free oxygen, during periods of sluggish fermentation, or to do without it by setting up active fermentation; such are the yeasts.

Fermentations may be grouped as (1) splitting; (2) oxidative; (3) compound.

(1) Splitting fermentations are most common; they consist in the separation of the fermentable substance into two or more products. The best-known of these is the alcoholic fermentation of sugar, produced chiefly by yeasts (*Saccharomyces*) and mucors. In this process, which is employed commercially on a large scale in the manufacture of beer, wine, and spirits, and in the making of bread, most of the sugar (95 per cent.) is split up into alcohol and carbon dioxide thus: $C_6H_{12}O_6 = 2C_2H_5OH + 2CO_2$. The other 5 per cent. is differently fermented, the products being glycerin, succinic acid, etc. It has been recently shown that this action is due to zymase, an enzyme formed by the yeast, in which several others had previously been found. Only sugars, the number of carbon atoms in whose molecules is 3 or a multiple of 3, can be fermented in this way. Of the hexoses only four, and those dextrorotatory, are fermentable. Cane-sugar, a disaccharide, is first broken up by invertase into glucose and fructose, which are then fermented. Different yeasts attack the sugars differently; some ferment maltose and not saccharose; some ferment fructose better than glucose, others act on it less readily. Alcoholic fermentation is stopped by the accumulation of alcohol in the fluid; 12 per cent. retards and 14 per cent. stops action. Lactic acid fermentation is well known from causing the 'souring' of milk and fruit-juices. Sauerkraut and ensilage depend for their acidity upon it. Lactic acid bacteria (especially the *Bacterium acidi-lactici*) are the agents. They attack the glucose directly, and the saccharose and lactose after 'inversion,' converting the former into glucose and fructose and the latter into glucose and galactose. About 83 per cent. of the sugar is converted into ethylidene lactic acid in its three isomeric forms; the rest is transformed into various by-products. The presence of 8 per cent., or even less, of free acid stops the fermentation. Butyric fermentation is responsible for the aroma of butter. The products (among which are butyric acid) are numerous and diverse; the process is complex and varied in its details.

(2) Oxidative fermentations cause the formation of new compounds by oxidation of the old.

The most important case is presented by the transformation of ordinary alcohol into vinegar. In making malt vinegar, dilute alcohol is allowed to trickle slowly over beech shavings slimy with the acetic organisms, *Bacterium aceti*. By the time the liquid reaches the bottom of the cask, the alcohol has become converted into acetic acid. The oxidation takes place in two steps represented, respectively, according to the following chemical equations.

$$\text{1. } \underset{\text{Alcohol}}{CH_3CH_2OH} + \underset{\text{Oxygen}}{O} = \underset{\text{Aldehyde}}{CH_3CHO} + \underset{\text{Water}}{H_2O}$$

$$\text{II. } \underset{\text{Aldehyde}}{CH_3CHO} + \underset{\text{Oxygen}}{O} = \underset{\text{Acetic Acid}}{CH_3COOH}$$

Precisely the same changes take place when alcohol is subjected to the action of ordinary chemical oxidizing agents in the laboratory.

(3) Compound fermentations are combinations of splitting and oxidative fermentations. They include mainly putrefactions, the chemical changes of which are little known. The products are numerous and often ill-smelling. See ENZYMES; DIGESTION; RESPIRATION; VINEGAR; ALCOHOL; BEER; BREWING; DISTILLED LIQUORS.

FERMENTED AND DISTILLED LIQUORS. See DISTILLED LIQUORS; LIQUORS, FERMENTED AND DISTILLED, STATISTICS AND HISTORY OF.

FERMO, fĕr′mō. A city in the Province of Ascoli Piceno, Italy, 1020 feet above the sea, not far from the Adriatic, of which it has a splendid view, and 37 miles south of Ancona (Map: Italy, H 4). The cathedral rests on the foundations of a famous temple of Juno; at the main gate are the ruins of a very ancient wall; and in the city hall, part of which dates from the fourteenth century, are Roman antiquities and inscriptions. Fermo has a lyceum, a gymnasium, an industrial school, a theatre, and a public library; is lighted by electricity; and ships large quantities of grain, silk, and wool via Porto San Giorgio, which is three miles distant. Its name comes from that of the ancient Firmum Picenum, whose ruins are in the vicinity. Population, in 1901 (commune), 20,542.

FER′MOR, ARABELLA. The daughter of James Fermor of Tusmore, the theft of whose curl by Lord Petre inspired Pope's "Rape of the Lock." She died in 1738.

FERMOR, fär′mōr, WILLIAM, Count (1704-71). A Russian soldier, born at Pskov, in the government of that name. He was commissioned lieutenant-general in 1746, and in 1758 was placed in command of the Russian Army in the war against Frederick the Great. On August 25 of that year he was defeated by Frederick at Zorndorf, and in 1759 relinquished the command to General Soltikoff. He was subsequently for a time Governor of Smolensk.

FERMOY, fĕr-moi′. A town in the east of Cork County, Ireland, on the right bank of the Blackwater, 19 miles northeast of Cork (Map: Ireland, C 4). The hills to the south of the town reach an altitude of 1388 feet in Knockinskeagh. Fermoy is an important garrison town with barrack accommodation for 3000 troops. It is the seat of an extensive Roman Catholic establishment comprising a cathedral, episcopal palace, two convents, and a college. Agricultural products and grist-mills constitute the principal industries. Fermoy dates from the foundation of a Cistercian abbey in the twelfth century; its modern importance is due to the enterprise of Sir John Anderson, who built the barracks, platted the town, and established a mail-coach service throughout Munster at the beginning of the nineteenth century. Population, about 6500.

FERN (AS. *fearn*, OHG. *farn*, Ger. *Farn;* probably connected with Skt. *parna*, feather, leaf, and with Russ. *paporoti*, Ir. *raith*, fern). A plant of the order Filicales, one of the three great living groups of pteridophytes. The group contains about 4000 of the 4500 species belonging to the pteridophytes, and therefore is usually considered to be the representative group. Although known in considerable numbers in the temperate regions, its chief display is in the tropics, where ferns form a striking and characteristic feature of the vegetation. In habit ferns vary from those with delicate and filmy moss-like leaves to tree-like forms, rising to a height of 35 to 45 feet, and crowned by a rosette of leaves 15 to 20 feet long. The various species of ferns are prevailingly terrestrial plants, but some of them are aquatic, even floating; while there are numerous forms, especially in the tropics, which are epiphytic—that is, they grow upon other plants. The Filicales differ from the other groups of pteridophytes chiefly in having a few large leaves which do both foliage work and spore-bearing. The alternation of generations (q.v.) is very distinct, the sexual plant (gametophyte) being represented by the prothallium, and the sexless plant (sporophyte) by the leafy plant. The prothallium is like a small liverwort, with a dorsiventral body, and numerous rhizoids extending from its under surface. It is so thin that all of the cells contain chlorophyll, and it is usually short-lived. The antheridia (male organs) and archegonia (female organs) are usually developed on the under surface of the prothallium, and differ from those of the mosses in that they are sunken in the tissue of the prothallium and open on the surface, more or less of the neck of the archegonia projecting. The eggs are not different from those formed within the archegonia of mosses, but the sperms are very different. The fern sperm is a long spirally coiled body, blunt behind, and tapering to a long beak in front, where numerous cilia are developed.

The sexless, leafy plant consists in the main of a subterranean dorsiventral stem, which gives out secondary roots from beneath and sends up characteristic aërial leaves which have long been called 'fronds.' The leaves are recognized not merely by their ordinary habit of branching, but better by their venation, which is forking or dichotomous (q.v.), and by their vernation, which is coiled or circinate. The spore-vessels (sporangia) are borne for the most part on the under surface of the foliage leaves, usually closely associated with the veins, and organized into groups of definite form known as 'sori.' The sorus may be round or elongated, and is usually covered by a delicate flap known as the 'indusium' (q.v.), which arises from the epidermis. Occasionally the sori are extended along the under surface of the margins of the leaf, as in the maiden-hair fern and common brake, in which case they are protected by the inrolled margin. While in most cases the leaves doing foliage work also produce sporangia, there are some forms in which the two kinds of work are separated, certain leaves doing only foliage work and others producing spores, the latter being called sporophylls, as in the ostrich-fern (*Struthiopteris*), the climbing fern (*Lygodium*), the royal fern (*Osmunda*), etc. An ordinary fern sporangium (spore-vessel) consists of a slender stalk bearing a spore-case. This case has a delicate wall formed of a single layer of cells, and extending vertically almost around it from the stalk, like a meridian about a globe, is a row of peculiar cells with thick walls, forming the heavy ring called the 'annulus.' The annulus is like a bent spring, and when the delicate portion of the case-wall yields the spring straightens violently, the case-wall is torn, and in the rebound the spores are discharged with considerable force.

The true ferns are often divided into two great groups on the basis of the origin of their sporangia. In one case the sporangium is purely an external structure, being derived from a single epidermal cell, and such ferns are said to be 'leptosporangiate.' In other ferns the sporangium involves the deeper structures as well, and is really an internally developed organ; such ferns are 'eusporangiate.' The eusporangiate ferns are the more primitive forms, and probably were the only kind in the extensive fern display of the Carboniferous period. The leptosporangiate ferns are the modern and abundant forms. There are two great divisions of Filicales, namely the 'true ferns' (Filices) and the 'water ferns' (Hydropteridæ). Among the Filices six great families are ordinarily recognized, as follows: Osmundaceæ, containing the royal ferns; Gleicheniaceæ, which are tropical forms; Schizæaceæ, which include the climbing ferns as well as various other peculiar genera; Hymenophyllaceæ, which contain the ferns with the most delicate bodies, often called the 'filmy ferns'; Cyatheaceæ, which include among other forms the tree-ferns; and finally Polypodiaceæ, the greatest and most highly organized family, to which almost all of the true ferns of the temperate region belong.

The water-ferns (Hydropteridæ) contain but few forms, and grow either in water or marshy places. They are of particular interest from the morphological standpoint, because they are heterosporous (q.v.). There are two distinct families. Marsiliaceæ, represented by the common Marsilia, contains semi-aquatic species with slender stems, which send down numerous roots into a mucky soil, and give rise to comparatively large leaves, each of which has a long erect petiole, and a blade of four wedge-shaped leaflets like a four-leaved clover. From near the base of the petiole another leaf-branch arises in which the blade is modified as a spore-bearing structure, which incloses the spore-case and becomes hard and nutlike. The other family is the Salviniaceæ, represented by Salvinia, whose species are floating forms.

Fossil Ferns. Leaves and stems of fossil ferns are common in all geological formations above the Silurian, and they are especially abundant in the Coal Measures of the Carboniferous age. Indeed, ferns may be considered to have been the dominant forms of the Paleozoic land flora, not alone by reason of their abundance, but also because of their large size. Many of them were tree-ferns that grew in the vast forests along the swampy shores of later Paleozoic seas. A large number of the Paleozoic genera seem to have had their sporangia inclosed by the tissue of the fertile leaf, as seen in the modern adder's-tongue fern (Ophioglossum), and its allies the Marattias. Because of this structure, these genera are included in a suborder, the Eusporangia.

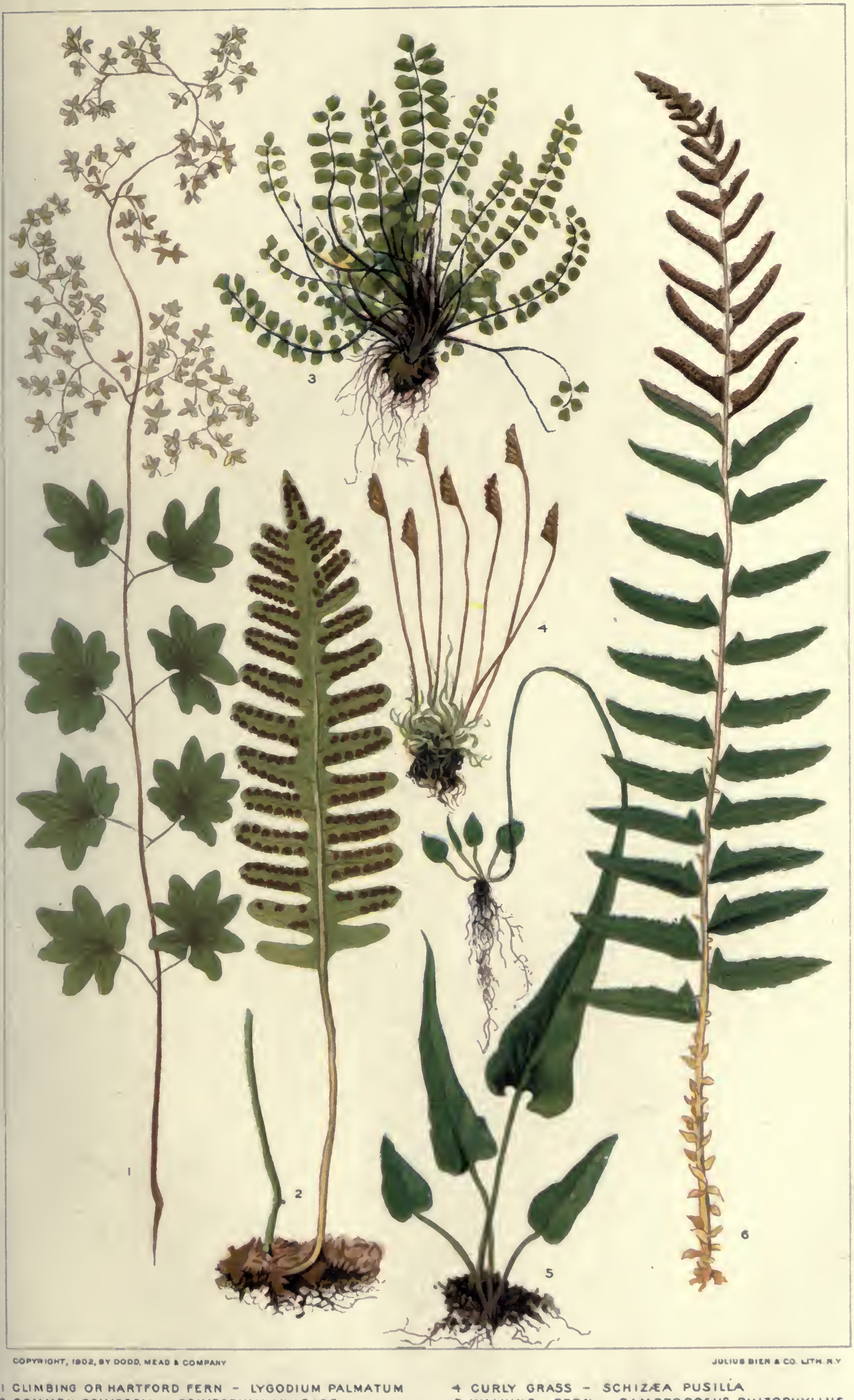
Although fragmentary fern-leaves and some supposed stems are found in Lower Devonian rocks, well-preserved specimens are not found until the Upper Devonian (Catskill) sandstones are reached, where Archæopteris is obtained. In the Coal Measures, where ferns are abundant, the principal genera are Pecopteris, a tree-fern; Neuropteris, Archæopteris, Dictyopteris, Odontopteris, Alethopteris, etc., which are herbaceous ferns of large size; and Hymenophyllum and Sphenopteris, which are delicate ferns that must have formed the undergrowth of the forest vegetation. In the Permian and Triassic periods the most important genus was Glossopteris (q.v.); and an allied genus, Tæniopteris, is very common in the Jurassic rocks. During Cretaceous time the ferns began to resemble more closely those of to-day, and in Tertiary time a large number of modern species appeared.

Consult: Lyell, *Geographical Handbook of All the Known Ferns* (London, 1869); Baker, *Summary of New Ferns Discovered Since 1874* (London, 1892); Hooker and Baker, *Synopsis Filicum* (London, 1874); Eaton, *The Ferns of North America* (Boston, 1880); Goebel, *Outlines of Classification and Special Morphology of Plants*, trans. by Garnsey (Oxford, 1887); Solms-Laubach, *Fossil Botany* (Oxford, 1891), contains a full bibliography of paleobotany, including works on ferns. Consult also: Zittel, Schimper, and Barrois, *Traité de paléontologie, Part II. Paléophytologie* (Paris, 1891); Bernard, *Eléments de paléontologie* (Paris, 1895); Gardner, "Monograph of the British Eocene Flora, Vol. I. Filices," *Monographs of the Palæontographical Society* (London, 1879-82); Feistmantel and others, "Fossil Flora of the Gondwana System," *Palæontologica Indica, Series II. and XII.* (Calcutta, 1876-81). The most important works describing the fossil ferns of North America are: Fontaine and White, "The Permian or Upper Carboniferous Flora of West Virginia and Pennsylvania," *Second Geological Survey of Pennsylvania*, vol. PP (Harrisburg, 1880); Lesquereux, "Description of the Coal Flora of the Carboniferous Formation in Pennsylvania and Throughout the United States," *Second Geological Survey of Pennsylvania, Report of Progress* P, vols. i., ii., and v. (Harrisburg, 1880-84); D. White, "Fossil Flora of the Lower Coal Measures of Missouri," *Monographs of the United States Geological Survey*, vol. xxxvii. (Washington, 1899).

FERN, Fanny. The pseudonym of Mrs. Sara Payson Willis Parton.

FERN, Male. A popular name given to the fern *Aspidium filix-mas*, or as some botanists call it, *Dryopteris filix-mas*. The male fern has a stout, more or less erect, chaffy, perennial rootstock, from which arise numerous annual, bright green fronds, forming tufts one to four feet high. The stipe and midrib of the fronds are beset with brownish chaffy scales. The frond is oblong lanceolate, acute at apex and narrow below; the pinnæ are lanceolate, somewhat scattered toward the base of the stalk, and often confluent above; the fruiting bodies, or sori, are borne near the midrib of the ultimate segments of the fronds. Male fern is a native of Europe, Asia, Northern Africa and the New World, where it is found

FERNS



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1 CLIMBING OR HARTFORD FERN - LYGODIUM PALMATUM
2 COMMON POLYPODY - POLYPODIUM VULGARE
3 MAIDEN-HAIR SPLEENWORT - ASPLENIUM TRICHOMANES
4 CURLY GRASS - SCHIZÆA PUSILLA
5 WALKING-FERN - CAMPTOSORUS RHIZOPHYLLUS
6 CHRISTMAS-FERN - ASPIDIUM ACROSTICHOIDES

in rocky woods from Labrador to Alaska, and southward into the United States. It is also found in the Andes of South America. The part of the plant which is of commercial importance is the rootstock, which should be gathered between August and October, when its active constituents are most abundant. It is slightly tonic and astringent, but its chief use is as an anthelmintic, especially against tapeworms, for which it is considered a specific. This property of the male fern has long been known and is mentioned in the writings of Dioscorides, Theophrastus, Galen, Pliny, and others. The principal constituents of the rootstock are a greenish oil, the color being due to cholorphyll, a volatile oil, resin, and filicic acid, the latter being considered the active principle.

FERN, Sweet. See Sweet-Fern.

FERNANDEZ, *Span. pron.* fĕr-nän′-dĕth, Juan (1536-1602). A Spanish navigator. For forty years Fernandez was the leading pilot on the Southern Pacific coast. He made numerous voyages between the Spanish headquarters at Panama and the Peruvian and Chilean settlements. It is reported that he also made a voyage westward and visited the unknown lands of New Zealand or Australia, but this is extremely improbable. As the prevailing southern winds and shore currents made the voyage down the coast extremely slow, he was accustomed to sail well out to sea, with the result that he made the voyage in one-third the time taken by the vessels which hugged the shore from cape to cape. His rivals declared that he was aided by the powers of evil, and he acquired the nickname of the 'Wizard.' On one of these voyages, probably in 1562, he hit upon the desert island which has since borne his name. He took possession of it, made a settlement there of sixty Indians, and tried to establish a fishing station. He soon failed and returned to the mainland, leaving on the island a few goats, whose descendants have been its principal inhabitants ever since. A friend took pity on the old and poverty-stricken sailor and gave him a plot of land at Quillota, in the Chilean mountains, where he settled down, after marrying, about 1590 or 1592. He left one son, from whom descended a large family of sailors. Consult: Vincuña-Mackenna, *Juan Fernandez, historia verdadera de la isla de Robinson Crusoe* (Santiago de Chile, 1883).

FERNANDEZ DE CASTRO, fĕr-nän′dĕth dȧ kä′strô, Manuel (1825—). A Spanish geologist. He was born in Madrid, and after graduating at the School of Mines there, traveled in various countries to study their railroad systems. The system of railroad signals suggested by him in his *La electricidad y los caminos de hierro* (1857) has been generally adopted. He was engaged in Government mining and geological work from 1859-69 when he became professor at the Madrid School of Mines. He was appointed director of the commission on the geological map of Spain in 1873.

FERNANDEZ DE CÓRDOBA, kôr′dô-vȧ, Diego, Marquis of Guadalcázar. A Spanish administrator of the seventeenth century, viceroy of Mexico and Peru. He was born, probably, at Cordova, and was a descendant of Gonzalo de Córdoba, 'the Great Captain.' He was Viceroy of Mexico from October 18, 1612, until March 14, 1621. In 1616 he suppressed a serious revolt of the Tepehuan tribe of Indians, who had murdered several Jesuit missionaries living among them. While in Mexico he founded the cities of Lerma (1613), Córdoba (1618), and Guadalcázar (1620), and during his viceroyalty the aqueduct from Chapultepec to Mexico by way of San Cosme was completed. Transferred to Peru, Fernandez governed that province as Viceroy, from July, 1622, to January, 1629, during which time he repelled the corsairs who ravaged the coast. In 1623 the Dutch under Jacob the Hermit, with a squadron equipped with 1700 men and 300 cannon, blockaded Callao for six months and attempted to take Lima. During his administration of the province, Peru prospered and enjoyed a considerable degree of internal peace and quiet. Fernandez returned to Spain in 1629.

FERNANDEZ DE LA CUEVA, lȧ kwā′vȧ, Francisco, Duke of Albuquerque (c.1610-?). A Spanish administrator. He was Viceroy of Mexico from 1653 to 1660, and as such is said to have encouraged science and art, and built up the City of Mexico, but to have been excessively fond of display. The great cathedral of Mexico was completed and dedicated during his administration. In September, 1660, he was appointed Viceroy of Sicily.

FERNANDEZ DE LA CUEVA HENRIQUEZ, ân-rē′kâth, Francisco, Duke of Albuquerque. A Spanish administrator of the eighteenth century, a grandson of Francisco de la Cueva. He was Viceroy of Mexico from November 27, 1702, to January 15, 1711. His term as Viceroy, like that of his grandfather, was marked by no great event, but was remarkable rather for the vast sums of money he squandered in order to maintain his splendid court, which far surpassed that of his predecessors, and rivaled in pomp the most brilliant courts of Europe. The town of Albuquerque, N. M., founded at this time, was named in his honor.

FERNANDEZ DE PALENCIA, dȧ pä′lân-thē′ȧ, Diego (c. 1520-81). A Spanish soldier and author. He was born at Palencia, Spain, and in 1545 went to Peru, where he served in the Civil War of 1553-54. Appointed historiographer by the Viceroy Hurtado de Mendoza in 1556, he wrote his celebrated work *Primera y segunda parte de la historia del Perú* (1571), which was an account of the Spaniards in Peru from 1544 to 1564. It is generally considered an authoritative work, and is the best contemporary account of the conquest of Peru, although some critics have accused the author of partiality.

FERNANDEZ MADRID, mȧ-drēᴅ′, José (1789-1829). A South American physician, statesman, and poet. He was born at Cartagena, New Granada (Colombia), and was educated at Bogotá. He took an active part in the revolt against Spanish rule, was a deputy to the revolutionary Convention at Cartagena, and upon the establishment of the Republic of New Granada was chosen a representative in its first general Congress. On March 14, 1816, he became President of New Granada, but was captured by the Spaniards and sent to Havana, Cuba, where for nine years he practiced as a physician, and also achieved considerable distinction as an author. Upon his return to New Granada in 1825, he was appointed by Simon Bolivar Minister to England. In June, 1820, he founded *El Argos*, a scientific and political periodical. His other works include two tragedies, *Atala* (1822), and *Guatimozin* (1827); a valuable treatise on yellow fever; a book of poems; and various papers on medical, agricultural, and scientific subjects. His fugitive poems and the volume entitled *Las Rosas* are considered his best works.

FERNANDINA, fẽr′nȧn-dē′nȧ. An early name of Cuba, given in honor of Ferdinand of Castile.

FERNANDINA, fẽr′năn-dē′nȧ. A city, port of entry, and the county-seat of Nassau County, Fla., on Amelia Island, 36 miles north by east of Jacksonville; the terminus of the Florida Central and Peninsular Railroad (Map: Florida, G 1). It has a good harbor on Amelia River which separates the island from the mainland. The city carries on an export trade amounting annually to about $4,600,000, the principal articles of shipment being phosphates, lumber, naval stores, cotton, etc. Fernandina is also a popular winter resort. Among points of interest in the vicinity are Amelia Beach, reached by a fine shell road, and Cumberland Island. The latter was the home of General Nathaniel Greene, and is the burial-place of 'Light Horse Harry' Lee. Settled by Spaniards in 1632, Fernandina was laid out in 1856, and incorporated in 1859. The present government is administered under a charter, last revised in 1899, which provides for a mayor, elected biennially, and a city council. The waterworks and electric-light plant are owned and operated by the municipality. Population, in 1890, 2803; in 1900, 3245.

FERNAN′DO, *Sp. pron.* fĕr-nän′dō (1) The disloyal friend of Cardenio in Cervantes's *Don Quixote.* (2) A Venetian captain, the lover of Annophel, in Fletcher and Massinger's *The Laws of Candy.* (3) The son of the title character in Knowles's *John of Procida,* and husband of Isoline, slain in the Sicilian Vespers.

FERNANDO DE NORONHA, dȧ nô-rō′nyȧ. A lonely island in the South Atlantic, situated in latitude 3° 50′ S. and longitude 32° 25′ W., about 200 miles east-northeast of Cape Saint Roque, on the coast of Brazil, to which it belongs (Map: South America, F 3). It is about 8 miles in length. The surface is rugged, rising in places to an altitude of about 1000 feet. The island, of volcanic origin, is well wooded and the soil is productive, but lack of sufficient rainfall prevents the growth of luxuriant vegetation. It is used as a place of banishment for Brazilian criminals. Population, 2000, mostly convicts, who cultivate small farms.

FERNANDO PÓO, *Sp. pron.* fĕr-nän′dō pō′. A volcanic island in the Bight of Biafra, in latitude 3° 30′ N. and longitude 8° 45′ E., about 20 miles off the west coast of Africa (Map: Congo Free State, A 2). It is about 44 miles in length and 20 miles in breadth, with a total area of about 770 square miles. It has a very mountainous surface, rising to an altitude of over 9300 feet at the highest point. The soil is fertile and well watered, but the climate is excessively hot and unhealthful, the temperature varying but little throughout the year, the average for the coolest month being 74° F. and for the warmest 82° F. The chief products are bananas, rice, yams, and corn. The trade is insignificant. The population, composed of native negroes and Portuguese, in 1900, was 20,741. The island takes its name from the Portuguese navigator Fernando, or Fernao do Pao, who discovered it in the latter part of the fifteenth century. In 1778 it was occupied by Spain. In 1827 the English, with the consent of Spain, founded the colony of Clarencetown, which is now Santa Isabel, and has a population of about 1500. Being abandoned by the English in 1834, the island was again taken over by Spain a few years later.

FERNANDYNE, fẽr′nan-dēn. A character in Thomas Lodge's *Rosalynde,* the original of Jacques du Bois in *As You Like It.*

FERNEY, or **FERNEY-VOLTAIRE,** fâr′nā′ vŏl′târ′. A town in the Department of Ain, France, five miles northwest of Geneva (Map: France, M 5). It is noted as the residence from 1758 to 1778 of Voltaire. A bronze statue of the philosopher is one of the ornaments of the town, and the château that he built, containing numerous personal relics, is annually visited by a large number of tourists. Population, in 1901, 1269.

FERNEY, The Patriarch of. Voltaire, so called from his place of retirement near Geneva.

FERNKORN, fẽrn′kôrn, Anton Dominikus (1813-78). An Austrian sculptor, born at Erfurt, in the Province of Saxony, Prussia. He was a pupil of Stiglmayer and Von Schwanthaler at Munich, and in 1840 established himself at Vienna, where he executed his first important work, the heroic equestrian statue "Saint George and the Dragon" (courtyard of the Montenuovo Palace). In 1858 he completed for the Cathedral of Speyer six of the eight free-stone statues of the German emperors there buried. He was appointed director of the Imperial bronze-foundry at Vienna, and in that capacity did some of his best work (including the colossal esquestrian statues of the Archduke Karl and of Prince Eugène, 1860 and 1865, in the Burgplatz, Vienna). He was skillful in his designs, but frequently inclined rather to the graphic than the truly plastic.

FER′NOW, Bernhard Eduard (1851—). An American forester. He was born at Inowraclaw, Prussia, and was educated at the Academy of Forestry at Münden, and at the University of Königsberg. He came to the United States in 1876, and became chief of the Division of Forestry in the United States Department of Agriculture in 1886. This position he retained until 1898, when he was appointed director and dean of the New York State College of Forestry of Cornell University. For some time he was editor of *The Forester.* His publications include: *The White Pine* (1899) and *Report upon Forestry Investigations of the United States Department of Agriculture,* 1877-98 (1899), and the *Economics of Forestry* (1902). The annual reports and bulletins of the Division of Forestry of the United States Department of Agriculture were edited by him from 1886 to 1898.

FERN-OWL. See Nightjar.

FER OL′IGISTE (Fr., from *fer,* Lat. *ferrum,* iron + *oligiste,* from Gk. ὀλίγιστος, *oligistos,* least, from ὀλίγος, *oligos,* small; so called as containing less iron than its related magnetic oxide). A term sometimes applied to those steel-gray varieties of *hematite* that have a metallic lustre, especially the ores from Elba, Russia, and Sweden, which are also called *specular iron ore.*

FEROZEPORE, fē'rôz-pôr'. See FIROZPUR.

FER'RACUTE, or **FER'RAGUS** (It. *Ferran*). A personage appearing in many mediæval romances, and in particular in *Valentine and Orson.* He is a giant of either Spanish, Portuguese, or Saracen extraction, of great strength, and invulnerable until he meets Orlando. In his castle is a great head of brass, which answers all his questions.

FERRAND, fȧ'räɴ', JOSEPH (1827—). A French jurist. He was born at Limoges and from 1871 to 1874 was prefect successively of Haute Savoie, Aisne, and Calvados. In 1888 he was appointed corresponding member of the Academy of Moral and Political Sciences. His principal works are the following: *De la propriété communale en France et de sa mise en valeur* (1859); *Les institutions administratives en France et à l'Etranger* (1879); *La réforme municipale en France et en Italie* (1881); *Les pays libres, leur organisation et leur éducation d'après la législation comparée* (1884); *L'organisation municipale de Paris* (1887).

FERRAND, MARIE LOUIS (1753-1808). A French soldier, born at Besançon. He saw his first active service under Count Rochambeau in America, and was present at the capitulation of Lord Cornwallis at Yorktown. His friendship for Lafayette led to his imprisonment during the Terror. In 1801, as second in command, he accompanied General Leclerc's expedition to Santo Domingo. Ferrand was placed in command of the troops in the eastern part of the island, and was successful in his campaign; but the army under Leclerc, in the western part of the island, after being almost wiped out of existence by yellow fever, had surrendered to the insurgents, and Ferrand, with only 1800 troops, found himself suddenly face to face with a hostile army of 25,000 men, under Dessalines, the rebel leader. He held out bravely for two years, until reinforced by Admiral Missiessy. As Governor-General, in which position he succeeded Leclerc, he kept the island in comparative peace for several years. Toward the end of 1808 there was a general uprising, with which Ferrand, deserted by the Spanish colonists, was unable to cope. He was attacked and defeated by a superior force under Ramirez, a creole leader, and killed himself on the battlefield rather than survive to bear what he considered the disgrace of defeat.

FER'RAR, NICHOLAS (1592-1637). An English theologian. He was born in London, the son of a wealthy merchant, and was educated at Cambridge. From 1618 to 1623, after extensive travels on the Continent, he gave up all his time to the Virginia Company. On the revocation of its charter in 1623, Ferrar turned his attention to political life, and in 1624 was elected to Parliament. Afterwards he bought a neglected manor house and estate at Little Gidding, in Huntingdonshire, where he was joined by the families of his brother and brother-in-law. He was ordained a deacon, and became the religious head of the community, although he never took priest's orders. With the increasing hostility to everything partaking of Romanism, and the growth of Puritanism, Little Gidding was made the object of bitter attacks, a pamphlet published concerning it in 1641 being entitled *The Arminian Nunnery.* At Little Gidding Ferrar lived quietly, devoting himself to theological studies and preparing a harmony of the Gospels, of the Mosaic Law, and a history of the Israelites. These works were printed and bound by members of the community. Consult Peckard, *Life of Mr. Nicholas Ferrar* (Cambridge, 1790), of which there have been reprints and revisions.

FERRARA, fĕr-rä'rȧ (Lat. *Forum Alieni*). A city in North Italy, capital of the Province of Ferrara, 5 miles south of the Po, 30 miles north of Bologna (Map: Italy, F 3). It is situated in fertile, marshy, unhealthful territory, the threshold of the city hall being 3 feet lower than the level of the Po. The broad streets, the ancient walls, towers, and bastions, and the crumbling palaces, attest the mediæval glory of Ferrara when it was the seat of the House of Este (q.v.). In the ancient castle, now occupied by the local authorities and the telegraph office, are frescoes by Dosso Dossi, and dungeons, in one of which the faithless Parisina Malatesta (consult Byron's poem, "Parisina") was confined by her husband before being beheaded, May 21, 1425. The Cathedral of San Giorgio has a striking façade, dating from the eleventh, twelfth, and thirteenth centuries, but the interior was modernized by Mazzarelli in 1712. Artists whose work is represented here are Baroncelli, Lombardi, Tura, Bastianino, Fr. Francia, Garofalo, Panetti, Giacomo da Siena. The campanile is massive and handsome. Other interesting churches are San Francesco, dating from 1494 and covered with domes, with (sixteen repetitions), echo and frescoes by Garofalo and monuments of the House of Este; Santa Maria in Vado, which was altered in 1495 in the Early Renaissance style, and has frescoes by Bonone; San Benedetto, built 1496-1553, with paintings by Scarsellino.

Other interesting buildings are the episcopal seminary, formerly the Palazzo Trotti, with frescoes by Garofalo; the Palazzo Schifanoja, begun by Alberto d'Este in 1391, completed by Borso in 1469, with celebrated fifteenth-century frescoes, now an asylum for deaf mutes; the incomplete Palazzo Costabili, with frescoes by Ercole Grandi; the sixteenth-century Palazzo de' Diamanti, containing the municipal Ateneo and an important picture gallery, most of the works in which belong to the school of Ferrara, at the head of which ranks Dosso Dossi (1479-1542); the Hospital of Saint Anna, where Tasso was confined (1579-86); the tiny house of Ariosto, now the property of the city, and bearing a Latin couplet composed by himself; the house of the poet Guarini, which still belongs to his family. In the Piazza Ariostea is a statue of Ariosto (1833) by Vidoni, and between the castle and the cathedral is a monument by Galetti to Savonarola (q.v.), born here in 1452.

The university, which is not a State institution, was founded in 1264, and, after various vicissitudes, reopened in 1815. It has botanical gardens, a physical laboratory, faculties in medicine, mathematics, and jurisprudence, a rich collection of ancient coins and inscriptions, and a library with 100,000 volumes, over 2000 manuscripts (among them several from the hand of Ariosto himself), 3200 autographs, and numerous etchings, etc. The monument of Ariosto is in the library. Ferrara also has a theological seminary, a gymnasium, etc., an Ariosto Society, four theatres, numerous charitable institutions, a chamber of commerce, a telephone system, and public gardens. The city markets wheat, rice, hemp, wine, silk, cattle, salt, and fruit, and has silk, hemp, and soap factories and flour-mills.

At the end of the tenth century, when Ferrara began to become prominent, the popes, basing their authority on grants from Pepin and Charlemagne, bestowed it as a fief on the margraves of Tuscany. In 1208, after a period of independence, it came under the rule of the Este (q.v.), who persuaded Paul II., in 1471, to raise it to a duchy. In 1598, on the extinction of the main branch of the House of Este, Ferrara was united by force to the Papal States by Clement VIII. In 1797 it was united to the Cisalpine Republic, and afterwards to Napoleon's Kingdom of Italy. It was restored to the Pope in 1814, and in 1859 became part of the dominions of Victor Emmanuel. Population, in 1881, 76,000; in 1901, 87,648. Consult: Frizzi, *Memorie per la storia di Ferrara* (5 vols., Ferrara, 1857-48); Gennari, *La università di Ferrara* (Ferrara, 1879); Ferrara e Antolini, *Ferrara nella storia del risorgimento italiano 1814-21* (Ferrara, 1885).

FERRARA-FLORENCE, Council of. The Council of Basel, convened in 1431 by Pope Martin V., having fallen into a series of disputes with Martin's successor, Eugenius IV., the latter in 1437 issued a bull transferring the sessions to Ferrara. He was obeyed only by Cardinal Julian, the president, and four bishops; the council itself continued in session at Basel. (See Basel, Council of.) To the five delegates, however, who met at Ferrara, January 5, 1438, others fresh from their homes were added, so that at the second session seventy-two bishops were present, over whom the Pope presided. The Emperor of Constantinople, John Palæologus, was also present, and brought with him patriarchs, bishops, and other ecclesiastics, amounting in all to seven hundred persons. His object in coming was to effect the reunion of the Greek and Latin churches, in the hope that he could thus secure the aid of the West against the Turks, who were then pressing hard upon the Empire, and were destined (as afterwards shown) soon to overwhelm it. The Pope also desired this union as a personal triumph over his adversaries in the Council of Basel, and he hoped that he would be accepted as a leader of the crusade against the Turks. The points of difference between the Greek and Latin churches were (1) upon the doctrinal point whether the Holy Spirit proceeded, as the Greeks maintained, only from the Father, or, as the Latins held, from the Son also (see Filioque); (2) whether the bread used in the Lord's Supper should be leavened, as the Greeks held, or unleavened, as the Latins did; (3) whether the Pope should be accepted as the head of Christendom, overriding the authority of the Greek patriarchs; (4) whether the Greek doctrine of prayers for the dead who departed in faith but without having had time to bring forth fruits worthy of repentance, or the Roman doctrine of purgatory with its punishments, even to the faithful, should be maintained. These and some minor points were discussed. In January, 1439, in consequence of the outbreak of the plague in Ferrara, the sessions of the council were continued in Florence, and there an agreement between the representatives was arrived at—viz. the supremacy of the Pope was acknowledged, the Spirit said to proceed from the Father through the Son, and the Latin views in general prevailed. But the union celebrated on July 6, 1439, was short-lived.

FERRARA, Francesco (1810-1900). An Italian political economist and statesman, born at Palermo. In 1834 he was appointed director of the Bureau of Statistics for Sicily. He was professor of political economy successively at Turin and at Pisa, and in 1864 became director of the Bureau of Rates and Taxes. He entered the Chamber of Deputies in 1865, was Minister of Finance under Ratazzi (from May to July, 1867), and in the following year was appointed director of the Royal School of Commerce at Venice. In 1881 he became Senator. He wrote a work on *Importanza dell' economia politica* (1849), and edited the first two series of the *Biblioteca dell' economista* (27 vols., 1850-68). His statistical writings appeared in a volume of the *Annali di Statistica* (Rome, 1890).

FER′RARESE′ SCHOOL OF PAINTING. One of the chief schools of northern Italy, usually grouped with the early school of Bologna as the school of Ferrara-Bologna. It owed its origin, in the middle of the fourteenth century, to followers of Squarcione (q.v.) of Padua, and was also influenced by the work of the Florentine Piero della Francesca (q.v.) at Ferrara. From the former it derived its archæological and naturalistic tendencies, from the latter its knowledge of perspective. It was also characterized by good drawing, modeling, and careful execution, but was deficient in color. The school of Ferrara grew up under the patronage of the House of Este. Its chief representatives were Cosimo, Tura, Lorenzo Costa, Dosso Dossi, and Garofolo (q.v.). The Bolognese school originated about 1470, when a number of Ferrarese artists, chief among whom was Lorenzo Costa, went to Bologna. Francesco Francia, the head of the school, learned painting from Costa; he and Timoteo Viti (q.v.) were its chief masters. Consult: Baruffaldi, *Vite de' pittori Ferrarresi* (Ferrara, 1844); Citadella, *Notizie relative a Ferrara* (ib., 1864); Laderchi, *Pittura Ferrarese* (ib., 1856); Crowe and Cavalcaselle, *History of Painting in North Italy*, vol. i. (London, 1871); Morelli, *Italian Painters*, vol. ii. (ib., 1892).

FERRARI, fĕr-rä′rē, Benedetto (1597-1681). An Italian poet and composer, sometimes called Della Tiorba. He was born at Reggio, and was educated at Rome. The opera *Andromeda*, for which he wrote the text, and which was set to music by Manelli da Tivoli, and performed at Ferrari's expense at the Teatro San Cassiano at Venice (1637), was the first opera to be produced publicly, all previous compositions of this kind having been performed privately.

FERRARI, Gaudenzio (1471-1546). An Italian painter of the Lombard-Milanese school. He was born at Valduggia, in Piedmont. We know little of his life, which was passed mostly at Vercelli, Varallo, and Milan, where he took up his residence in 1536, and died on January 31, 1546. It is generally supposed that his first teacher was Girolamo Giovenone, at Vercelli; but Morelli has shown that the latter was several years his junior, and that his master at Vercelli was probably Macrino d'Alba. He is also reputed to have studied under Leonardo, Perugino, and Raphael, because of the influence of these masters upon his work. He indeed studied at Milan, but it must have been under Luini and Bramantino, pupils of Leonardo, and it is not likely that he ever crossed the Apennines. Whatever he adopted from these masters he thoroughly assimilated, adding to it an energetic naturalism of his own. In his earlier period he painted in the manner of the Lombard school, but toward the end of his life he adopted the more Titanic forms then in vogue. His works always display intense dramatic action, although the composition is often overcrowded. The coloring is bright, sometimes even gaudy, but harmonious, in his frescoes. He excels especially in heads and draperies. His works are of unequal merit, but he is in many respects the most powerful master of the Milan school.

Among Ferrari's earlier works are a triptych representing a "Holy Family with Saints" (1511), for the Church of Santa Maria at Arono, and altarpiece for the Church of Canobbio and for San Gaudenzio at Novara (1514-15). He afterwards settled at Varallo, where he executed a number of his most important works. In 1513 he had finished in the Church of Santa Maria delle Grazie twenty frescoes of the "Life of Christ"—a wonderfully dramatic series in well-arranged, though sometimes crowded, groups. In the Chapel of Santa Margherita, in the same church, he painted two frescoes of the "Life of Christ" (finished in 1515), and for San Gaudenzio a fine altarpiece, the "Marriage of Saint Catherine"—perhaps the best of his earlier work. He decorated with frescoes the walls of three of the 'stations' or chapels of the Sacred Mountain of Varallo, and painted the chief pictures in three others. Of these paintings, his great "Crucifixion," in the thirty-eighth chapel, is the masterpiece. The groups in this painting, in their symmetrical arrangement, and the dignified heads and harmonious colors, challenge comparison with Raphael himself, according to Morelli. In 1532-35 Ferrari decorated the transept of San Cristoforo, Vercelli, with frescoes of the "Life of the Virgin," and in 1535 the cupola of the Church of Saranno with a circle of "Singing Angels"—one of the finest existing specimens of such work. In 1542 he painted his last fresco, the "Scourging of Christ," in Santa Maria delle Grazie, Milan—a picture of grandiose effect. His "Martyrdom of Saint Catherine," the best known of his pictures (Brera, Milan), is of the same character. Few of his works exist outside of Lombardy. In the Louvre there is an excellent "Saint Paul," in the Berlin Museum an "Annunciation," and in the Historical Society of New York "Saint George and Saint Anthony of Padua."

Consult: Bordiga, *Notizie intorno alle opere di Gaudenzio Ferrari* (Milan, 1821); Colombo, *Vita ed opere di Gaudenzio Ferrari* (Turin, 1881): Morelli, *Italian Painters* (London, 1892-93).

FERRARI, Giuseppe (1812-76). An Italian historian and philosopher, born in Milan. He was educated at Pavia, and held professorships successively at Rochefort, Strassburg, Turin, and Milan. In philosophy, Ferrari was a disciple of his friend Romagnosi, and of Vico, whose works he edited and to whom he devoted one of his earliest volumes, *Vico et l'Italie* (1839). Of Ferrari's numerous historical works, may be mentioned: *Histoire des révolutions d'Italie* (1857-58); *L'annexion des Deux-Siciles* (1860); *Corso sugli scrittori politici italiani* (1862-63); *Teoria dei periodi politici* (1874). For his biography, consult Mazzoleni (Milan, 1877).

FERRARI, Luigi (1810-94). An Italian sculptor, born in Venice. He was a pupil of Canova and one of the artists employed on the great monument to him at the Church of Santa Maria dei Frari, Venice. Afterwards (1851) he became professor at the academy there. Among his works are a "Laocoön," "Endymion," "Melancholy," "David," and busts of Dante and Raphael.

FERRARI, Paolo (1822-89). An Italian dramatist and critic. He was born at Modena. His first success was *Goldoni e le sue sedici commedie* (1852). This was followed by several semi-romantic dramas and comedies, all of which are interesting and well constructed, but which have been criticised for their lack of originality. The *Opere drammatiche* (1877-80) is a collection of his principal works.

FERRARIS, fĕr-rä′rês, Carlo Francesco (1850—). An Italian political economist and statistician, born at Moncalvo, Alessandria. He was a member of the Italian Bureau of Statistics from 1874 to 1876. In 1878 he became extraordinary professor at the University of Pavia, and in 1883 he was appointed a director in the Italian Ministry of Agriculture, Industry, and Commerce. He was called to the chair of statistics at Padua in 1885, and was a member of the Italian Chamber of Deputies in 1886-87. His works include: *La statistica e la scienza dell' amministrazione nelle facoltà giuridiche* (1878); *Moneta e corso forzoso* (1879); *Saggi di economia, statistica, e scienza della amministrazione* (1880); *L'assicurazione obbligatoria*, etc. (2d ed. 1890); "Die Banken in Italien," in the *Handwörterbuch der Staatswissenschaften*, vol. ii. (2d ed. 1899); *Principii di scienza bancaria* (1892).

FERRARIS, Galileo (1847-97). An Italian physicist and electrical engineer. He was born at Livorno, Piedmont, and was educated at the University of Turin and the Royal School of Engineering in that city, from which he graduated as a civil engineer in 1869. In 1872 he received the degree of doctor of mathematics, and in 1879 he became professor of physics in the industrial museum and military college at Turin, devoting himself to the study of technical physics. He was one of the foremost electricians in Europe, and was sent by the Italian Government as a delegate to various international electrical congresses and exhibitions, and was president of the department of electricity at the exhibition held at Turin in 1884. At that time he was engaged in an investigation of electrical transformers with a view to determining their efficiency and other properties. In subsequent experiments many additional data from both the practical and theoretical standpoint were accumulated, and further investigations carried on in August and September, 1885, resulted in the discovery of the rotatory magnetic field. This was produced by two alternating currents with a quarter difference of phase, and was in effect a revolving magnet in stationary apparatus, and made possible the two-phase motor. The investigation was described at length before the Royal Academy of Sciences of Turin, March 18, 1888. An important memoir by Ferraris, *On the Difference of Phase of Currents, on the Lag of Induction and on the Waste of Energy in Transformers,* was published in 1887, and treats thoroughly the subject in its many bearings. In 1893 he published a theory of the single-phase alternating motor and toward the end of his life he was engaged in devising apparatus to transform alternating currents. The part played by Professor Ferraris in the development of alternating currents cannot be overestimated, and his works are considered standards.

FER′RATES (from Lat. *ferrum,* iron). Salts of the hypothetical ferric acid, including chiefly the barium, potassium, and sodium ferrates. See Iron.

FERREIRA, fĕr-rā′ė-rȧ, Antonio (1528-69). One of the classic poets of Portugal. He was born at Lisbon, and was educated at Coimbra, where he occupied himself especially with the study of the Italian and Latin authors, and where he remained for some years as professor of jurisprudence. Finally he obtained an important civil appointment at the Court of Lisbon, where he resided until his death from the plague. Of all the followers of Sá de Miranda, he was most successful in imitating the Italian and Latin forms of verse, perfecting the elegiac and epistolary styles already attempted by Miranda, and transplanting into Portuguese literature the epithalamium, the epigram, and the ode. His *Ines de Castro* is the earliest Portuguese tragedy, and, with the exception of Trissino's *Sophonisba,* the earliest in Europe, after the revival of letters. His comedies, *Bristo* and *Cioso,* both early works, are full of interest to the student of literary history. The second was translated into English by Musgrave (1835). Consult: Castilho, *Antonio Ferreira* (Rio, 1875), and Braga, *Historia dos Quinhentistas* (Oporto, 1871).

FERREIRA, Thomas A. R. See Ribeiro, Thomas A. R. F.

FERREIRO, fĕr′rȧ-ė′rȯ (Port., smith; from its cry). A Brazilian tree-frog or 'escurezo' (*Hyla faber*), 3½ inches in length, remarkable for its breeding habits. In February these frogs resort to muddy pools, where mating takes place, and the females form from the mud beneath the water circular walls, which rise two to four inches above the surface and inclose pools a foot or so in diameter, in which the eggs are laid, and where the tadpoles remain until well grown. These circular nurseries are constructed with much care by the females alone, each meanwhile carrying her male mate upon her back, waiting to fertilize her eggs. The work is done at night. Consult Goeldi, *Proceedings Zoölogical Society of London,* pp. 90-97 (1895).

FER′REL, William (1817-91). An American meteorologist. He was born in Bedford County, Pa., and early removed to Virginia. He was educated at Marshall College (Mercersburg, Pa.), and at Bethany College (Virginia), graduating from the latter institution in 1844. His meteorological researches won attention, both in America and Europe, and it may be said that many of the fundamental propositions of meteorology were laid down by him. He was associated as assistant in the computations of the *Nautical Almanac* until 1867, when he was appointed to the United States Coast and Geodetic Survey. From 1882 to 1886 he was stationed at Washington, as an assistant in the Signal-Service Bureau, where he continued his independent investigations. His maxima and minima tide-predicting machine has been for many years in general use in the Government coast surveys. Among his literary productions may be mentioned: "The Problem of the Tides," in Gould's *Astronomical Journal* (1856); *Converging Series; Ratio of Diameter and Circumference of Circles* (1871); *Tidal Researches* (1874); *Meteorological Researches* (1875-81); *Influence of the Earth's Rotation on the Motion of Bodies; Motions of Fluids and Solids; Tidal Action.*

FERRET (Fr. *furet,* It. *furetto,* from ML. *furetus,* diminutive *furo,* ferret, from Lat. *fur,* thief; apparently connected by popular etymology with Lat. *fera,* wild beast). (1) An animal of the weasel family (Mustelidæ), so nearly allied to the polecat (*Putorius fœtidus*) that many regard it as a mere domesticated albinotic variety. Others regard it as a distinct species, which they call *Putorius furo.* It is of rather smaller size, the head and body being about 14 inches long, the tail 5½ inches, the muzzle somewhat longer and more pointed, the head rather narrower; the color is very different, being yellowish, with more or less of white in some parts, due to two kinds of hair, the longer partly white, the shorter yellow. The eyes are pink. It is, however, much more susceptible to cold than the polecat, and requires careful protection from it in climates where the polecat is a hardy native. It was imported into Europe from Africa, and was used in Rome as a mouser. Attention to warmth and cleanliness is essential to the health of ferrets. They are capable only of partial domestication, acquiring a kind of familiarity with man, and submitting with perfect quietness to his handling, but apparently never forming any very decided attachment; and they never cease to be dangerous if not carefully watched, especially where infants are within their reach. If allowed any measure of freedom they are ready to attack poultry, and kill far more than they can devour, merely sucking the blood. They generally breed twice a year, each brood consisting of six or nine. The female sometimes devours her young, in which case another brood is speedily produced. Consult Everitt, *Ferrets: Their Management* (London, 1897). See Plate of Fur-Bearing Animals.

(2) In the Western United States, a weasel of the plains, the black-footed ferret (*Putorius nigripes*), which lives in the prairie-dog 'towns,' feeding on those animals. It is pale brown, with the feet, tip of tail, and a bar across the face black. It is about two feet long.

FERRETING. The ferret is bred and trained in captivity. Rabbits have the same instinctive apprehension of coming danger from the presence of the ferret that birds in general have of the sky-flying hawk, and sportsmen take advantage of this characteristic. They breed the ferret and place it—sometimes free, sometimes on a string, and sometimes muzzled—in the burrows or underground runs in a rabbit-warren, from which its presence causes the rabbits to scurry off into the open fields. The young ferrets are taught by being entered in the first instance with their mother, who soon initiates them into working a burrow. Ferrets are equally efficacious in starting rats from their underground homes, or from the bottom of grain-stacks, where they do great damage.

FER′REX AND POR′REX. See GORBODUC.

FERRI, fĕr′rê, CIRO (1634-89). An Italian painter, born in Rome. He was the pupil of Pietro da Cortona, and so imitative of that master that it is difficult to distinguish their pictures. After the death of Pietro he completed the latter's unfinished works, notably the frescoes in the Pitti Palace at Florence. Ferri's principal works are the frescoes of biblical subjects in Santa Maria Maggiore at Bergamo and the frescoes in the cupola of Sant' Agnese, Rome. Among his easel-pictures are: "The Repose in Egypt;" "Madonna" (Munich); "The Triumph of Bacchus" (Hampton Court); "Christ Appearing to Mary Magdalen" (Vienna); "Alexander Reading Homer;" his own portrait; and "Christ on the Cross" (in the Uffizi Gallery, at Florence). He is also known by some skillful miniature drawings for religious works of the time.

FERRI, ENRICO (1856—). An Italian criminologist, born at San Benedetto-Po, Mantua. He studied at Bologna, Pisa, and Paris, lectured at various Italian universities, latterly practicing law at Rome. Since 1886 he has been a Socialist member of the Chamber of Deputies. His publications include: *Sociologie criminelle* (1893; published in Eng. trans. as *Criminal Sociology,* New York, 1896, in the Criminology Series); *La scuola positiva di diritto criminale* (1883); *Difese penali e studi di giurisprudenza* (1898); and *Deliquenti nell' arte* (1901).

FERRI, LUIGI (1826-95). An Italian philosopher, born at Bologna. He was educated in France, and taught in several of the French colleges before he settled in his native country. After occupying the chair of philosophy and history at the Institute of Florence (1863), he was called to the same position at the University of Rome (1871). While there he became corresponding member of the Institute of France and editor of *Rivista italiana di filosofia.* His works include: *Il genio d'Aristotele* (1866); *Il senso commune nella filosofia* (1872); *La psicologia di Pietro Pompanazzi* (1877). In French he wrote: *Essai sur l'histoire de la philosophie en Italie au XIXème siècle* (1869) and *La psychologie de l'association depuis Hobbes jusqu'à nos jours* (1883). He represented in philosophy a spiritualism akin to Cousin's, whose pupil he was.

FERRIC OXIDE, or SESQUIOXIDE OF IRON. See IRON; HEMATITE.

FER′RICY′ANIDE OF POTAS′SIUM. See HYDRO-FERRICYANIC ACID.

FER′RIER, DAVID (1843—). A Scottish neurologist. He was born in Aberdeen, Scotland; studied at Aberdeen and Edinburgh in Scotland, and at Heidelberg in Germany, and was appointed professor of neuro-pathology in King's College, London, in 1872. He also became physician in the Hospital for Epilepsy and Paralysis. His researches on the functions and the diseases of the brain have formed contributions of the highest importance to the science of medicine. He published: *The Functions of the Brain* (1876), and *Cerebral Localization* (1878), and was also a founder and an editor of *Brain: A Journal of Neurology.*

FERRIER, JAMES FREDERICK (1808-64). A Scotch metaphysician, born in Edinburgh. He graduated at Oxford in 1831, was elected to the chair of civil history in the University of Edinburgh in 1842, and to that of moral philosophy and political economy in the University of Saint Andrews in 1845. According to Ferrier's 'theory of knowing and being,' the ego enters as an essential constituent into every conception that the mind is capable of forming. The connection between the conceiving conscious mind and conceivable being is intimate and indissoluble. To be knowable, *object* must coexist with *subject,* and it is fallacious to speak even of our *ignorance* of 'matter *per se;*' for while we may be ignorant of what could possibly be known, we cannot be ignorant of what is absolutely unknowable—what is neither an entity nor a non-entity—the material world *by itself.* Ferrier's works include the *Institutes of Metaphysic* (1854) and *Lectures on Greek Philosophy and Other Philosophical Remains of J. F. Ferrier,* published posthumously (1866).

FERRIER, fâr′yâ′, JOSEPH MARIE AUGUSTIN GABRIEL (1847—). A French painter, born at Nîmes. He studied under Pils, Lecoq de Boisbaudran, and Hébert, and won the Prix de Rome in 1872. In 1878 his "Saint Agnes" (now in the Rouen Museum) obtained a first-class medal at the Paris Exposition, and in 1889 his "Mothers Cursing War" received the same honor. He was awarded the cross of the Legion of Honor in 1884. His drawing is excellent and his handling free and vigorous. His other works include: "Spring" (1881); a portrait of Claudius Popelin (1881); and "The Pipe-Smokers" (1887).

FER′RIER, SUSAN EDMONSTONE (1782-1854). A Scotch novelist. She was born in Edinburgh. Her first work, *Marriage,* appeared in 1818, and this was followed by *The Inheritance* (1824) and *Destiny* (1831). The merit of these tales, which are characterized by genial wit, a quick sense of the ludicrous, and considerable ability in the delineation of national peculiarities, is sufficiently proved by the fact that they have held their ground, notwithstanding the enormous number of novels which have flowed from the press since their publication. Her novels were edited by Johnson (London, 1893). Consult her *Memoirs and Correspondence,* edited by Doyle (London, 1898).

FERRIÈRES, fâr′ryâr′. A village in the Department of Seine-et-Marne, France, 17 miles southeast of Paris. It has an interesting thirteenth-century church, but is chiefly famous for the splendid château in modern Renaissance, which was the headquarters of King William of Prussia from September 19 to October 5, 1870, and in which Jules Favre unsuccessfully attempted to negotiate an armistice with Prince Bismarck. The château is the property of the Rothschild family. Population, in 1901, 961.

FER′RIS, ALBERT WARREN (1856—). An American physician and educator, born in Brooklyn, N. Y. He graduated at New York University in 1878, and at the College of Physicians and Surgeons in 1882. From 1883 to 1885 he was interne in the King's County Hospital, Flatbush, L. I.; from 1885 to 1891 resident and assistant physician in Sanford Hall, a private establishment for the treatment of insane and nervous patients at Flushing, N. Y., and in 1891 began medical practice in New York City. In 1893 he was appointed assistant in neurology at Columbia University, and in 1898 also assistant in medicine in the New York University medical department. He collaborated in the preparation of the *American Medico-Surgical Bulletin* (1894-96); became an editor of *The Medical Critic* (New York) in 1901; contributed medical articles to the *International Year-Book*, and was editor-in-charge of the medical department of *The New International Encyclopædia.*

FER'RIS, ISAAC (1798-1873). An American clergyman. He was born in New York City, and graduated at Columbia College in 1816. He served as bombardier at the Battery, New York City, during the War of 1812, under his father, Capt. John Ferris. After teaching Latin at the Albany Academy, he studied theology under the Rev. Dr. John Mitchell Mason, and at the Reformed Dutch Church Seminary, New Brunswick, N. J., where he graduated in 1820. He was successively pastor at New Brunswick, N. J. (1821-24); Albany, N. Y. (1824-36); and in the Market Street Dutch Reformed Church, New York City, the fashionable church of the old Seventh Ward (1836-53). He was president of the New York Sunday-School Union from 1857 to 1873, organizer and president of the Board of Foreign Missions of the Dutch Reformed Church, founder and president of Rutgers Female Institute, and third chancellor of the University of the City of New York, serving from 1852 till 1870, and by his admirable management relieving the institution from the debt which had incumbered it since its foundation. His publications include *Memorial Discourse; or, Fifty Years' Ministry in the Reformed Church of America* (1871).

FER'RO (Sp. *Hierro*). The most westerly of the Canary Islands (q.v.), having an area of about 105 square miles (Map: World, Eastern Hemisphere, G 19). It is of volcanic origin, rising to an altitude of 4640 feet; it has a population of over 6000. Ferro has been regarded as the most westerly point of the Old World. Geographers at one time reckoned longitude from the meridian of the island, and this custom prevailed with German cartographers until recently. The meridian of Ferro is 17° 40′ W. from Greenwich.

FERROL, fâr-rōl′ (Lat. *Ardobrica*), EL. A seaport in the Province of Corunna, Spain, situated on a narrow arm of the Bay of Betanzos, 12 miles northeast of Corunna (Map: Spain, A 1). Originally a fishing town, it was selected for its natural advantages as a seaport by Charles III., who erected here for the Spanish Navy what was at one time the finest naval arsenal in the world. The arsenal, with dockyards and shops, covers an area of about 24 acres, and is still one of the largest shipbuilding centres in Spain. A naval school is maintained in connection with it. Entrance to the harbor of El Ferrol is gained only through a very narrow strait, which is defended by the castles of San Felipe and Palma. The town, strongly fortified also on the land side, consists of three distinct sections, of which Ferrol Nuevo is most notable. Here are many of the finest buildings of the city, and the streets are wide and regular. El Ferrol has several squares and pleasant alamedas or promenades. The Plaza de Armas is the site of a fine memorial fountain to Churruca, a celebrated naval officer. The city has manufactures of sailcloth, leather, spirits, chocolate, linen, and hardware, and carries on an important trade. The fisheries also constitute an extensive industry. Population, in 1900, 26,257. El Ferrol appears first in history in the early years of the thirteenth century, but did not attain particular importance until its development in the eighteenth century as a naval station. An unsuccessful attack on the port was made in 1800 by the English. It was captured by the French in 1809 and in 1823.

FERRON, fâ′rôɴ′, THEOPHILE, ADRIEN (1830 —). A French general, born at Pré-Saint-Evrault, Eure-et-Loire. He studied at the Ecole Polytechnique, entered the engineers in 1852, and rose to be colonel in 1878 and a general of division in 1886. He distinguished himself in the Crimea, was appointed a professor of military science in the Ecole d'Application at Metz, became connected with the Ministry of War in 1880, and received the portfolio of War in 1887. His publications comprise: *Considérations sur le système défensif de la France* (1873); *Considérations sur le système défensif de Paris* (1875); and *Instruction sommaire sur le combat* (1883).

FERROTYPE (from Lat. *ferrum*, iron + Gk. *τύπος*, *typos*, type), or TINTYPE. A photographic print made on a plate of enameled iron previously coated with black varnish, and immersed first in collodion and then in a sensitive silver solution. After a few seconds' exposure, the operator proceeds at once to develop, fix, and wash the plate, on which the picture, though really nothing but an insufficiently exposed or poorly developed negative, appears like an ordinary photograph, owing to the dark color of the background. Consult Estabrooke, *Ferrotype, and How to Make It* (Cincinnati, Ohio, 1872). See PHOTOGRAPHY.

FERRUCCI, fĕr-rōō′chē, ANDREA (1465-1526). An Italian sculptor, born at Fiesole. He was a pupil of Michele Maini. He has much of the pure devotional charm of Mino, Rossellino, and Desiderio, although his later works, especially the "Saint Andrew" (in the Florence Duomo), show the influence of Michelangelo. He was superintendent of the works of the Duomo from 1512 to 1518, and executed a bust of Marsilio Ficino and a statue of Saint Andrew there. His masterpiece is the marble baptismal niche in the Cathedral of Pistoja, the compartments carved in relief with scenes from the life of Christ. The figures are nearly life size, and the composition is of great beauty. Other works are a marble reredos of exquisite detail, with an "Annunciation" in two medallions, in the Cathedral of Fiesole; a "Holy Family," in the Bargello, Florence; the tomb of the Saliceti, in San Martino, Bologna; and the decoration of the aisle of San Martino for Ferdinand I. of Naples. The tomb of Antonio Strozzi, which he began in Santa Maria Novella, Florence, was completed by his pupil, Casini, and Tommaso Boscoli.

FER'UMBRAS, SIR. The hero of an English translation of *Fierabras.* See FIERABRAS.

FERRY (from AS. *ferian*, to carry, Goth. *farjan*, to row, causative of AS., Goth., OHG. *faran*, Ger. *fahren;* connected with Gk. *περᾶν*, *peran*, Skt. *par*, to cross). A passage by boat, generally across a comparatively narrow waterway not readily provided with a bridge. Common row-boats are generally used for ferrying foot passengers, but when horses and carriages have to be taken across, a flat-bottomed barge may be used, propelled by oars or carrying sails; or drawn by a rope, either by manual labor or the force of the current, as noted below. Such boats are sufficient for light traffic, but where the traffic is heavy, or the crossing broad, steam ferryboats are used.

FLYING BRIDGE is the name sometimes given to a kind of ferryboat which is moved across a river by the action of the combined forces of the stream, and the resistance of a long rope or chain made fast to a fixed buoy in the middle of the river. The boat thus attached is made to take an oblique position by means of the rudder; the stream then, acting against the side, tends to move it in a direction at right angles to its length, while the rope exerts a force in the direction toward the buoy. The course of the boat and the action of the two forces are analogous to the path of a rising kite and to the forces of which this path is the resultant. The holder of the kite corresponds to the buoy, the wind to the tidal stream, and the tail to the rudder.

STEAM FERRYBOATS, until quite recently, were propelled by a paddle-wheel at each side, driven by a walking-beam engine. There was but one deck, placed a few feet above the water. This is still the most common type, but many of the boats built since 1890, particularly for service at New York City, are driven by means of screw propellers, and have two decks. The change gives more spacious cabins on the lower decks, makes a commodious and well-lighted saloon with an outer promenade possible on the second deck, increases the speed and mobility of the boats, and lessens the troubles caused by ice. The first of these double-screw ferryboats at New York was the *Bergen*, running between New York and Hoboken. It was put in use in 1889. A later boat of the same general type, and, on account of the long ferry, a particularly large one, is the *Berkeley*, built for the Southern Pacific Railway Company, to run between San Francisco and Oakland, Cal. This boat was put in service in 1898. It is a double-screw steel boat, driven by triple-expansion steam-engines. It is provided with bulkheads as a safeguard against accident. The boat has a length of 289 feet over all, a beam of 64 feet over all. She draws eight and one-half feet of water at extreme load, and has a registered gross tonnage of 1945 tons. She has a total seating capacity of 1709 passengers. Under ordinary conditions she makes her regular run of four and one-half miles in 17½ minutes, or at a rate of about fifteen miles an hour. An illustrated description of the boat is given in *Engineering News* (New York) for December 29, 1898.

FERRY-HOUSES are provided at each end of important ferries. They contain ticket offices and waiting-rooms, and often a great variety and number of accessories, like news and flower stands, and restaurants. To accommodate the landing-places to the rise and fall of the tides, or other variations in the water-level, bridges are provided, with the shore end made fast and the water end free to rise and fall with the water. The boats run into slips, formed of fenders, or piles covered with planking.

CAR-TRANSFER BOATS are used in place of bridges to convey trains of cars across streams or other bodies of water. In many instances, as in the case of the vast numbers of cars transferred at New York City, the trains are broken up into short sections, and run upon flatboats. These, when loaded, are towed by tugboats. In this manner the waters adjoining New York, Hoboken, and Jersey City are made to serve the same purpose as hundreds of acres of switching yards, while at the same time the cars are being transferred from one railway to another. Instead of mere flatboats, moved by tugs, some transfer-boats are self-contained. Probably the longest transfer route of this sort is that across Lake Michigan, from Frankfort, Mich., to Kewaunee, Wis., a distance of 63 miles. It was put in operation in 1892 by the Toledo, Ann Arbor and Northern Michigan Railway Company. Each boat carries 24 cars, placed on four parallel tracks, and is driven by three screw propellers. The boats are designed to break their way through ice. Special bridges are used to transfer the cars from the land to the boats. A lengthy illustrated description of these boats, and the lake terminals as well, is given in *Engineering News* of June 15, 1893. A car ferry 28 miles in length, across Lake Baikal, on the line of the Trans-Siberian Railway, was opened in 1900. The boats have broken through ice 39 inches thick.

In law a ferry is a grant from the sovereign power of a State, and is classed among incorporated hereditaments. The owner of this franchise has, as an incident thereto, the right not only to pass over the water, but to use the highway on either side for the conduct of his business. Indeed, a ferry is the continuation of the highway from one side of the water over which it passes to the other, although subject to the public right of navigation in such water. Any one who unlawfully invades the valid ferry franchise of another is liable in damages to the latter, and may be enjoined by the proper court from further interference. Such conduct may amount to a crime at common law or under modern statutes. Correlative to these legal rights of the ferry-owner are certain well-defined legal duties. Having received a public franchise, he is bound to serve the public faithfully and impartially. He must have suitable boats, docks, and accommodations; he must employ proper servants and agents, and his tolls must be reasonable. If he fails in the performance of any of these duties, he may be liable to a private action for damages, to a criminal prosecution, or to the forfeiture of his franchise. His liability for the safety of passengers and of freight is that of a common carrier (q.v.). See Glen, *Law Relating to Highways, Bridges, and Tramways* (2d ed., London, 1897); Pratt, *Law of Highways, Main Roads, and Bridges* (14th ed., London, 1897); Washburn, *Treatise on the American Laws of Real Property* (6th ed., Boston, 1902).

FERRY, fâ-rê, JULES FRANÇOIS CAMILLE (1832-93). A French statesman. He was born at Saint-Dié, in the Department of Vosges, April 5, 1832. Admitted to the bar in Paris in 1851, he became connected with the *Gazette des Tribunaux*, joining the group of young lawyers who opposed the Empire. He was among the famous thirteen condemned to imprisonment in 1864. In 1865 he became a writer on the *Temps*, where his brilliant political articles attracted much attention. In 1869 he was elected to the Corps Législatif, taking his seat among the members of the Left. He voted against the declaration of war with Prussia, and after the fall of Sedan he and the other Paris Deputies were proclaimed members of the Government of the National Defense, September 4, 1870. He was elected one of the representatives of the Department of the Vosges, and resigned his place in the Government in 1871. In 1872 he was appointed Minister to Greece by Thiers, but resigned the position the following year. When Grévy became President of the Republic in 1879, Ferry was appointed Minister of Public Instruction; the year following he became president of the Council and Prime Minister, but on November 14, 1881, resigned on account of the attacks made on his policy in regard to Tunis. In 1882 he was Minister of Public Instruction under Freycinet, and in the following year became Prime Minister again. In all of these positions he manifested bitter hostility to the Jesuits, and was largely instrumental in securing their banishment from France. In 1885 the unsatisfactory result of the war in Tongking, which culminated in the defeat of the French at Langsun, on the Chinese frontier, led to Ferry's final resignation, March 30th. In spite of his loss of political power, he was still an influential member of the Chamber of Deputies, and in 1888 was a candidate for the Presidency, but was defeated. Shortly after the election he was wounded, in December, 1887, by a pistol-shot fired by a fanatic named Aubertin in the lobby of the Chamber of Deputies. In 1889 he failed to be reëlected to the Chamber, but in January, 1891, was chosen Senator. He came unscathed through the Panama scandal, and was made president of the Senate, February 24, 1893. He died shortly after, March 17, 1893. Consult: Sylvin, *Célébrités contemporaines* (Paris, 1883); King, *French Political Leaders* (New York, 1882); The London *Spectator* (1893).

FER'RY, Orris Sandford (1823-75). An American legislator. He was born at Bethel, Conn., and graduated at Yale in 1844. He was a probate judge from 1849 to 1856, and a member of the State Senate from 1855 to 1857, as a member of the American Party. He was elected a member of the Thirty-sixth Congress as a Republican in 1859, and formed one of the celebrated Committee of Thirty-Three, organized to consider the condition and relation of the seceded States. In July, 1861, he recruited and became colonel of the Fifth Connecticut Volunteer Infantry, and he was commissioned a brigadier-general of volunteers by President Lincoln March 17, 1862, in which capacity he served to the close of the war. In 1866 he was elected to the United States Senate as a Republican, but his independence, and his opposition to the Civil Rights Bill in particular, threw him out of line with his party, and he was reëlected in 1872 by a combination of Liberal Republicans and Democrats, defeating General Hawley, the regular Republican candidate. He continued to act with the Republicans, however, and supported the Grant Administration, taking a leading part in framing the legislative acts that provided for carrying out the President's policy.

FERRY, fâ-rê, Paul (1591-1669). A French clergyman, who was born at Metz and spent his entire life there. He was the author of a number of unimportant works. A certain interest attaches to a correspondence he had with Bossuet (1666-67) upon the reunion of the Protestant and Catholic churches. His *Catéchisme général de la réformation de la religion* (1654) provoked a refutation from Bossuet. He is said to have received a pension from Richelieu for agitating this question.

FERRY, Thomas White (1827-96). An American politician, born in Mackinac, Mich. He was a member of the State Legislature for some time, and from 1865 to 1871 was a Republican member of Congress. He then served in the United States Senate for two terms, acting for much of the time as president *pro tempore;* and, on the death of Henry Wilson, was the acting Vice-President of the United States from 1875 to 1877.

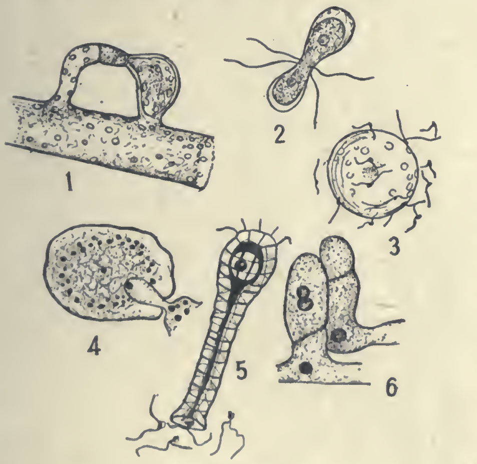
FER'RYLAND. An old-time port of entry, capital of Ferryland District, Newfoundland, 44 miles south of Saint John's (Map: Newfoundland, H 5). It has a fine harbor and lighthouse. As Avalon, it was founded in 1624 by Sir George Calvert, afterwards Lord Baltimore, and here in 1638 Sir David Kirke held the court of a count palatine with powers over the whole island. Ruins of the ancient fort exist. Its development was arrested by troubles with the French. Population, in 1891, 549; in 1901, 535.

FERSEN, fĕr'sen, Fridric Axel von (1719-94). A Swedish soldier and statesman, born at Stockholm. He served in the French Army from 1740 to 1748, and was promoted to the rank of major-general. As a lieutenant-general of Sweden he served in the Seven Years' War, and conquered the islands of Usedom and Wollin. In 1770 he became field-marshal. Thereafter he was an important factor in the politics of Sweden, until, as leader of the opposition to the royal aspirations of Gustavus III., he was apprehended in the Rigsdad of 1789, and ultimately compelled to retire from the political arena.

FERSEN, Hans Axel, Count (1758-1810). A marshal of Sweden, and the son of the preceding. He studied at the Turin military academy, served in America under Rochambeau, and became colonel of the regiment called Royal Suédois at the Court of Louis XVI. Out of devotion for Marie Antoinette, he accompanied the royal family in their flight to Varennes, and labored for their welfare after their capture. Returning to Sweden in 1793, he was made marshal, chancellor of the University of Upsala, and was sent as plenipotentiary to the Congress of Rastadt. When the Crown Prince of Sweden died suddenly in June, 1810, the people, who hated Fersen, accused him of having poisoned the Prince, and seizing him in the town hall to which he had been taken, murdered him (June 20, 1810). His complete innocence was subsequently established. Consult: Klinkowström, *Le comte de Fersen et la cour de France* (Paris, 1878); Graudat, *Un ami de la reine* (Paris, 1890).

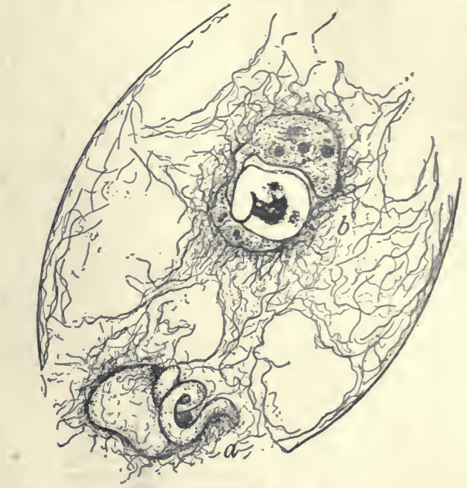
FERTILIZATION (from Lat. *fertilis*, fertile, from *ferre*, to bear, Gk. *φέρειν*, *pherein*, Skt. *bhar*, Goth. *bairan*, OHG., AS. *beran*, Eng. *bear*). In plants, the fusion of two sexual cells or gametes (q.v.). This process, sometimes called 'fecundation,' is exhibited in the life histories of most plants. Gametes are present in all plants, excepting the lower forms. The possible derivation of gametes has been suggested by the life histories of certain algæ, as Ulothrix, in which there is an evident relationship between gametes and the ordinary asexual swimming-spores. It is probable that gametes have in general been derived from asexual spores, and it is not surprising that they occasionally germinate as asexual spores. In the simplest cases of fertilization the gametes are similar, so that there is no distinction of sex. In this case the process is often called 'conjugation,' and plants which exhibit it are known as 'isogamous' plants. Almost all plants, however, are 'heterogamous;' that is, the pairing gametes have become so different that a distinction of sex is plainly evident. In heterogamous plants the male gamete is known as the 'sperm,' and the female gamete as the 'egg,' and fertilization in its restricted sense is the fusion of sperm and egg. Along with the differentiation of gametes has occurred the differentiation of sex-organs (gametangia), those developing sperms being called 'antheridia,' those developing eggs being called 'oögonia' or 'archegonia.' The result of fertilization is the formation of a spore which is in all plants technically the 'oöspore,' or fertilized egg. To distinguish the result of conjugation from that of ordinary fertilization, the name 'zygospore' or 'zygote' is commonly substituted for 'oöspore.' Among seed-plants a single free egg is developed within the embro-sac, and within the pollen-grain certain cells are developed which are called 'male cells,' and which are sperms in function.

One of the chief features in connection with the process of fertilization is the method by which the pairing gametes are brought together. In conjugation the two gametes have similar powers, and in the majority of cases are motile bodies, usually swimming by means of cilia. In some cases in the lower forms the gametes are brought together by the development of a tube which bridges the space between the sex-organs. In heterogamous plants the sperm is always the active gamete, and finds its way to the egg, which remains quiescent. Among the higher algæ, mosses, and ferns the sperm is, as a rule, a free-swimming ciliated cell, and is attracted to the oögonium or archegonium by various chemical substances which are secreted in connection with the female sex-organ. One of the distinguishing marks of the seed-plants, however, is that the sperm ceases to be a motile body, and is ordinarily transferred from the pollen-grain in which it is produced to the egg by means of a tube called the 'pollen-tube.' This tube in gymnosperms (pines, etc.) penetrates the tissues of the ovule lying above the embryo-sac, and in the angiosperms (flowering plants) it passes through the style, enters the ovary, and finds its way to the ovule. It is an interesting fact that in the Cycadaceæ (q.v.) ciliated sperms have recently been discovered, which indicates that the old free-swimming habit of the sperm had not been entirely abandoned with the introduction of pollen-tubes.



FERTILIZATION.

1, Sex-organs of Vaucheria; 2, conjugation of two ciliated gametes; 3, a large egg surrounded by numerous sperms; 4, antheridial tube entering egg of Cystopus; 5, sperms entering archegonium of a liverwort; 6, fusing cells.



DOUBLE FERTILIZATION IN LILY.

a, Fusion of sperm and egg; *b*, fusion of sperm with two polar nuclei.

While the passage of the sperm to the egg may be included under fertilization, the real act of fertilization consists in the fusion of the two naked cells. Just what happens in this fusion may be illustrated by the process of fertilization in the seed-plants. Each gamete is a naked cell consisting of a nucleus about which there is organized cytoplasm. In the sperm the nucleus is very prominent, and the cytoplasm relatively scanty. In the egg the nucleus is also prominent, but the cytoplasm is abundant, and contains a rich supply of food reserve. In the seed-plants it has been observed that the pollen-tube approaches the egg and discharges a male cell into the cytoplasm. The nucleus of the male cell then slips out of its cytoplasm as out of a sheath, and moves through the cytoplasm of the egg toward its nucleus. The male cytoplasm has thus been left behind in the egg-cytoplasm, and it is not clear that the fusion of the two holds any important relation to the act of fertilization. In any event, the most evident fact in fertilization is the approach of the male nucleus to the female nucleus, and the fusion of the two. Just what this fusion involves, and how complete it is, is not clear. The nuclei are exceedingly complex structures, and just how far the corresponding structures of the two nuclei fuse in this process is very uncertain. In certain seed-plants, as in gymnosperms, it has been observed that the two sets of chromosomes, which are thus brought together by the fusion of the two nuclei, do not fuse for some time, and in some cases for several cell-generations. It is evident, therefore, that the fusion does not necessarily involve a fusion of the chromosomes of the nuclei, which are regarded as probably the essential structures. The whole subject remains somewhat vague as to details, but the general fact that fertilization involves the fusion of two cells, and that in this fusion the two cytoplasms and the two nuclei take part, is well made out. The significance of the male cytoplasm, whether it simply acts as a carrier of the nucleus or is an essential feature in the fusion, and the details of nuclear fusion, whether it is a complete pairing of all of the structures which belong to the nuclei or not, are questions which investigation has not yet settled. See CELL; GAMETES; and articles on the various groups of plants mentioned above.

FERTILIZATION OF FLOWERS BY INSECTS. See CORN-FERTILIZATION; FLOWERS AND INSECTS; POLLINATION.

FERTILIZATION OF THE OVUM. See EMBRYOLOGY.

FERTILIZERS. A generic term for substances added to soil to increase the supply of plant-food. In its more restricted sense it embraces only such materials as have passed through some process of manufacture, and are known as commercial fertilizers. These include many inorganic materials, such as sulphate and chloride of potash, ammonite, nitrate of soda, phosphatic rock in various prepared forms, and also many organic substances, such as guano, ground bone, tankage, etc. In general, fresh manures are excluded from the list of commercial fertilizers; but dried ones, such as desiccated and ground sheep manure, are included. Like manures, fertilizers are often added to the mixtures of decaying organic remains and soil known as composts, in order to increase the available plant-food. For more detailed treatment, see MANURES AND MANURING.

FESCA, fĕs′kä, FRIEDRICH ERNST (1789-1826). A German violinist, born at Magdeburg. He studied in his native city and at Leipzig under Müller and Matthæ. He played in the orchestra at the theatre there, became violin soloist at Cassel (1814), and then concertmaster in Karlsruhe. He composed two operas, *Cantemira* (1819) and *Omar and Leila* (1823), and various quintets, overtures, and songs.

FES′CENNINE VERSES (Lat. *Fescennini, Fescennina*). A branch of the indigenous poetry of ancient Italy. They were a sort of dialogues in rude extempore verses, generally in Saturnine measure, in which the parties rallied and ridiculed one another. They formed a favorite amusement of the country people on festive occasions, especially at the conclusion of harvest and at weddings. As was to be expected, they often degenerated into licentiousness, that at last required the curb of the law. The Fescennine verses are usually considered to have been of Etruscan origin, and to have derived their name from the Etrurian town Fescennium; but there is little probability in this etymology. Verses of this sort are to this day popular all over Italy. The name is more likely connected with *fascinum*, fascination, enchantment, or the evil eye, against which the chanting of verses may have originally been intended as a protection. See SATIRE.

FESCH, fĕsh, JOSEPH (1763-1839). Cardinal Archbishop of Lyons and maternal uncle of Napoleon I., born at Ajaccio, Corsica. He was destined from the first for the Church, and received a careful education in the seminary at Aix, becoming a priest shortly before 1789. During the Revolution, however, Fesch served as commissary of war under his illustrious nephew, in Italy, up to 1799. On the inauguration of the Consulate Fesch resumed his clerical habit, and was instrumental in bringing about the concordat of 1801 with Pius VII. As a result of his activity he was made Archbishop of Lyons the year following, and in 1803 received the cardinal's hat. In 1804 he successfully negotiated the matter of the consecration of the Emperor by the Pope at Paris and assisted at the coronation in Notre Dame. He was next made Grand Almoner of France, Grand Cordon of the Legion of Honor, and member of the Senate. In 1806 Fesch was appointed, by Dalberg, Prince Primate of the Confederation of the Rhine, as his coadjutor and successor. In 1809 he declined the Archbishopric of Paris, and soon showed himself an opponent of Napoleon's policy with regard to the Papacy. Finally, in 1810, at the French ecclesiastical council at Paris he stood out in open opposition to the Emperor. Sent in disfavor to his diocese, Fesch attempted to communicate with Pius VII., but his letter was discovered and he fell into open disgrace. In 1814 Fesch retired to Lyons, but reappeared during the Hundred Days, returned to his diocese, and was made a member of the House of Peers by Napoleon. Banished by the Bourbons, he retired to Rome in 1815, and passed the rest of his life in luxurious retirement, leaving his diocese to be administered by a vicar. He died in Rome, May 13, 1839. Consult his "Correspondance," in Du Casse, *Histoire des négociations diplomatiques* (Paris, 1855); Lyonnet, *Le cardinal Fesch* (Lyons, 1841).

FESCUE (corrupt. of *festu*, OFr. *festu*, Lat. *festuca*, straw, stalk), *Festuca*. A genus of grasses, very nearly allied to brome-grass (q.v.). The species are numerous, and are very widely diffused over the world, both in the Northern and Southern Hemispheres. Among them are many of the most valuable pasture and fodder grasses. Tall or meadow fescue (*Festuca elatior*), a species with spreading panicle and linear spikelets, from two to four feet tall, common in most meadows and pastures of rich soil in Great Britain and throughout Europe, in northern Asia, and in some parts of North America, is perhaps excelled by no meadow or pasture grass whatever. It is suitable both for meadows and for permanent pasture. *Festuca pratensis*, by many botanists regarded as a variety of meadow fescue, is an excellent grass for rich moist meadows. Hard fescue (*Festuca duriuscula*), known by various other synonymous names, a grass from one and a half to two feet tall, with a somewhat contracted panicle, mostly on one side, is one of the best grasses for lawns and sheep pastures, particularly on dry or sandy soils. Several varieties are known to seedsmen and farmers. Creeping fescue, or red fescue (*Festuca rubra*), is distinguished chiefly by its extensively creeping root, which particularly adapts it to sandy pastures and to places liable to occasional inundations. Sheep's fescue (*Festuca ovina*) is a smaller grass than any of these, not generally exceeding a foot in height, and often much less, abundant in mountainous pastures, and especially suitable for such situations, in which it often forms a principal part of the food of sheep for many months of the year. It is common in all the mountainous parts of Europe and in the Himalayas, and is also a native of North America. Species very similar to this, if not mere varieties of it, abound in the Southern Hemisphere. Its habit of growth is much tufted. Of species which have been inintroduced into cultivation in the United States and Great Britain, *Festuca heterophylla*, referred by some authors to various other specific names, best deserves notice. It is a tall species with narrow root-leaves, and broad leaves on the culm. It is a native of France and other parts of the Continent of Europe, and is pretty extensively cultivated in some countries, particularly the Netherlands. A number of species abound in the Western United States, where they are important constituents in the range pastures. All these species are perennial. Some small annual species occasionally form a considerable part of the pasture in dry, sandy soils, but are never sown by the farmer. A Peruvian species, *Festuca quadridentata*, called 'pigouil' in its native country, and there used for thatch, is said to be poisonous to cattle.

FESS (OF. *fesse*, Fr. *faisse*, *fasce*, fesse, from Lat. *fascia*, bundle). In heraldry (q.v.), one of the charges known as ordinaries.

FES′SENDEN, Reginald Aubrey (1866—). An American electrician, born at Milton, Quebec Province, Canada. From 1887 to 1890 he was head chemist of the laboratory of Thomas A. Edison, the inventor; from 1890 to 1892 an electrician with the Westinghouse Company of Newark, N. J., and in 1892-93 professor of physics and electrical engineering in Purdue University (Lafayette, Ind.). In 1893-1900 he was professor of electrical engineering in the Western University of Pennsylvania (Allegheny, Pa.), and in the latter year became a special agent of the United States Weather Bureau.

FESSENDEN, Thomas Green (1771-1837). An American writer. He was born at Walpole, N. H., and graduated at Dartmouth in 1796. He was for some time in London engaged in an enterprise which ruined him financially, and while there advertised the metallic tractors of Benjamin D. Perkins (q.v.) in a grotesque poem entitled *Terrible Tractoration* (1803), a satire upon the medical profession which opposed the use of the instruments. In 1822 he started in Boston the *New England Farmer*, with which he was connected until his death. For two years he was editor of the *Weekly Inspector* in New York City. Among his further works are: *Pills, Poetical, Political, and Philosophical, Prescribed for the Purpose of Purging the Public of Piddling Philosophers, Penny Poetasters, of Paltry Politicians, and Petty Partisans, by Peter Pepperbox, Poet and Physician* (1809); *Democracy Unveiled* (1806); *American Clerk's Companion* (1815); *The Ladies' Monitor* (1818); and *Laws of Patents for New Inventions* (1822). Consult Hawthorne, *Fanshawe, and Other Pieces* (Boston, 1876).

FESSENDEN, William Pitt (1806-69). An American statesman. He was born in Boscawen, N. H., graduated at Bowdoin College in 1823, and began the practice of law in 1827. He settled in Portland, Maine, was elected to the State Legislature in 1832, and became known as an able debater. In 1840 he was elected to Congress as a Whig, but served only one term. He won national repute as a lawyer, and as an Anti-Slavery Whig orator and campaign speaker, and in 1848 he was a strong supporter of Webster for the presidency. In 1854, while a member of the Maine Legislature, he was elected United States Senator, by the combined votes of the Whig and Anti-Slavery Democratic members. A fortnight after taking his seat in the Senate, he delivered a stirring speech in opposition to the Kansas-Nebraska Bill, thereby leaping at once into prominence as one of the ablest speakers on the Anti-Slavery side. In 1859 he was reëlected to the Senate for a second term as a Republican, and was at once made chairman of the important Committee on Finance, in which position, during the next five years he ably seconded President Lincoln and Secretary Chase in their attempts to solve the puzzling financial questions arising from the war. Upon the resignation of Secretary Chase in 1864, President Lincoln and his counselors naturally turned to Senator Fessenden as the man best fitted to take the vacant portfolio of the Treasury. Fessenden hesitated at first, but after it became evident that there was need of his services and that both President and nation looked to him in the emergency, he accepted. The period was one of the blackest in the financial history of the country. Gold was at 280, the currency of the nation was inflated, the paper dollar was worth only 34 cents, and the government had just found it necessary to withdraw from the market a loan which it had been unable to float. The first act of the new Secretary in this crisis was the issuance of the famous "seven-thirty" bonds,—bonds bearing interest at the rate of 7.30 per cent., and issued in denominations as small as $50. His idea was that if appeals were made to the patriotism of the people, and the loan offered in such sums that people of moderate means could invest, it would succeed, and his judgment proved correct. He also withheld the further issue of greenbacks for the time being, thus inducing the State banks to adopt the national system. Gold having fallen to 199 and the necessities of the occasion having been met, Secretary Fessenden resigned his portfolio in March, 1865, in order to take his seat in the Senate, to which he had been chosen for a third term. In the years immediately following the war he took a leading part in the debates and was chairman of the joint committee on reconstruction. His action in voting for the acquittal of President Johnson on his impeachment trial brought upon him the harshest criticism of his political career. He bravely faced the storm of reproach which it called forth, and although for the moment his political associates looked upon him as almost a traitor, his sincerity and honesty of purpose were so apparent, and his continued devotion to the principles of the Republican Party so absolute that he very soon won again his old position as a party leader.

FESSLER, fĕs′lĕr, Ignaz Aurelius (1756-1839). A well-known Hungarian historian and ecclesiastic. He was born at Czurendorf and educated at Pressburg and Raab. He was successively a Capuchin monk in Vienna, professor of hermeneutics at Lemberg, a Protestant and Freemason at Berlin, a lecturer on philosophy at Saint Petersburg, a Government official at Saratov, and, lastly, general superintendent of the Lutheran Community of Saint Petersburg. He wrote several historical novels (*Marc Aurel, Matthias Corvinus, Attila*) now well-nigh forgotten, a *History of the Hungarians*, possessing great merit, and an autobiography charming in manner and style, *Rückblicke auf meine Siebzigjährige Pilgerfahrt* (Breslau, 1826). He died at Saint Petersburg, December 15, 1839.

FESSLER, JOSEPH (1813-72). An Austrian Roman Catholic theologian, born at Lochau, in the Crownland of Vorarlberg. He studied at Innsbruck and the Seminary of Brixen; was ordained priest in 1837; in 1841 was appointed instructor in Church history at Brixen, and in 1843 in canon law also. He was elected to the Frankfort Parliament in 1848; received appointment to the chair of Church history at Vienna in 1852, and was transferred to that of canon law in 1856. In 1861-62 he was a member of the Congregation for the Oriental Rites at Rome, and in 1864 became Bishop of Saint Pölten. From 1869 he was general secretary of the Vatican Council. His most important work is his *Institutiones Patrologiæ* (1850-51; new edition by Jungmann, 1890-96). He also wrote a *Geschichte der Kirche Christi* (4th ed. 1877), and on the infallibility of the Pope, of which dogma he was a zealous exponent, *Die wahre und die falsche Unfehlbarkeit der Päpste* (1871). Consult the biography by Erdinger (Brixen, 1874).

FES'TA, COSTANTIO (c.1490-1545). An Italian singer and composer, celebrated as the forerunner of Palestrina. He was born probably in Rome, where in 1517 he entered the Pontifical Chapel as a singer and contrapuntist. He was very soon appointed *maestro* in the Vatican, and retained his position until his death. Only a few of his numerous masses, motets, madrigals, and litanies have been printed. His *Te Deum*, published in Rome in 1596, is a composition of remarkable beauty, and is still sung at the Vatican at Corpus Christi and on other solemn occasions. Several of the works of Festa are preserved in the archives of the Vatican and in the collections published by Giardane and Scotto (sixteenth century). Festa is generally regarded as the first great composer of the Roman school. His madrigal *Quando ritrovo la mia pastorella* ("Down in a Flowery Vale") is still popular in England.

FES'TE. Olivia's clown in Shakespeare's *Twelfth Night*. He joins in the plot against Malvolio, and some of the author's best lyrics are sung by him.

FESTIN DE PIERRE, fĕs'tăN' de pyâr'. See DON JUAN.

FESTIN'IOG. A town and railway junction in Merionethshire, Wales, 8½ miles east-northeast of Portmadoc (Map: Wales, B 4). It is situated amid picturesque mountain scenery, and is noted for its slate-quarries, which give employment to most of its inhabitants. Population, in 1891, 11,050; in 1901, 11,400.

FESTIVAL PLAYS. See MYSTERIES.

FESTIVALS (OF., Fr. *festival*, from ML. *festivalis*, from Lat. *festivus*, festive, from *festum*, feast), or FEASTS. Days or seasons set apart for public rejoicing and rest from ordinary labor, at stated intervals, or occasionally for religious purposes solely, or for the celebration of some person or event. Originally, all festivals were of a religious character, since eating, drinking, and other pleasures connected with them could not be indulged without sharing these enjoyments with the divinities. The earliest of all festivals seem to have been connected with the cult of the dead. At great banquets communion was held with the departed spirits and offerings were made to them. As clans grew and became scattered, such common meals could only be arranged occasionally. When the great luminaries began to attract worship and the ancestral spirits were in some way connected with them, these banquets were held annually or monthly. While purely animistic festivals are still observed in different parts of the world, when food and drink are offered to the dead at their burial-places, in the vast majority of instances the primitive significance has been obscured or wholly obliterated by a superinduced reference to natural phenomena or historic events. Wandering tribes are greatly attracted by the changing phases of the moon, and the festivals characteristic of the nomadic state are chiefly lunar. When men settle down to agricultural life, they become dependent on sunshine and rain; winter and summer, seed-time and harvest, equinoxes and solstices become the occasions for festivities. With the development of a more complex social organization and the rise of great empires, the interest in national self-preservation becomes acute, and the feasts assume a political character as celebrations of deliverance and victory. Veneration of the great religious leaders who have deeply impressed a people's life leads to the setting apart of certain days in their honor. But whatever new significance is added to an earlier festival, something of its old character is likely to adhere to it. The god who sleeps during the winter and is awakened from his slumber at the vernal equinox has much in common with the ancestral spirit to whom new vitality is given by a libation of blood, and it is natural that the celebration of those mighty beings whose changing fortunes and all too human experiences were seen portrayed in the ceaseless play of nature's forces, should borrow a feature from the banquets in honor of the departed dead. Fellowship with and likeness to the spirits associated with the elements of nature are sought in more exacting cultic performances. In solemn mimicry and self-inflicted pains the acts and sufferings of the deity are imitated. Sympathy with the solar divinity as well as with his mother and his spouse in the loss of generative power and the recovery of reproductive strength is expressed by the worshiper in self-imposed impotence and sterility, or unrestrained sexual abandonment. Songs, shouts, dances and processions, simple scenic representations, and ultimately the drama are the results of such symbolic actions. When historic personalities and events begin to be celebrated, the character of the gods is apt to be transferred to the heroes, and the divine experiences blend with the human. This is especially the case with the great religious leaders, whose apotheosis is most natural.

The festivals celebrated by the ancient Toltecs and Aztecs of Mexico, and the Incas of Peru, while retaining features of ancestor-worship, were for the most part of a solar and lunar character. The Mexicans had their chief feasts in May, June, and December. The Peruvians, besides the new moons, also celebrated the summer and winter solstices and the equinoxes. The Chinese have a very elaborate system of festivals. Of these the most important is the one celebrated in honor of the dead at the winter solstice. Even the Buddhists of China have their feasts commemorating the birth of Gautama Buddha, his departure from home, and his entrance into Nirvana. The Karens have an annual feast in honor of the departed, while the Nagas of Assam make their offerings to the dead each moon. In Siam the 8th and 15th of every month are considered sacred. From the Yajur Veda period to the present day numerous feasts have been observed in India. The Holi at the vernal equinox and the Dasahara in the autumn are mentioned as early as Aitareya Brahmana. In honor of Vishnu, Siva, and Indra, the Ganges, and the goddess Kali, festivals are still held. The ancient Persians had four solar feasts, at the solstices and the equinoxes, an annual funeral feast in February, a celebration of the five intercalary days, and several festivals to which a historic significance was given, as celebrations of victories like that of Iran over Turan, and of Feridun over Zohak. The Fravardigan, or New Year's Feast, had distinctly animistic features. With the Mithra cult its great feast on the 25th of December passed to Asia Minor and the West. The Asianic peoples seem to have had their festivals at the equinoxes. Thus the Phrygians celebrated the sleep and the awakening of the sun-god in the fall and the spring. The intense worship of the mother-goddess in Asia Minor no doubt influenced profoundly the festivals of the Ionian Greeks.

In Greece each demos had its peculiar calendar. But the ἑορτή, or new-moon feast (Odyssey, xx. 156) was probably kept very generally in earlier times. A harvest festival, and an ancestral feast in honor of Erechtheus also go back to a high antiquity (Iliad, ix. 533; ii. 550). The Athenian calendar which is best known contains one or more festivals each month. In January the *Lenæa*, or wine-press feast in honor of Dionysus was celebrated (see Bacchus); in February the *Anthesteria* of Dionysus, the *Diasia* of Zeus, and the lesser *Eleusinia* (see Eleusinian Mysteries); in March the *Pandia* of Zeus, the *Elaphebolia* of Artemis, and the greater *Dionysia;* in April the *Munychia* of Artemis, and the *Delphinia* of Apollo; in May, the *Thargelia* of Apollo, and the *Plynteria* and *Callynteria* of Athene; in June, the *Diipolia* of Zeus, and the *Scirophoria* of Athene; in July, the *Cronia* of Cronus, and the *Panathenæa* (q.v.) of Athene; in August, the *Metageitnia* of Apollo; in September, the *Boëdromia* of Apollo, the *Nemeseia*, and the greater *Eleusinia;* in October, the *Pyanepsia* of Apollo, the *Oschophoria* of Dionysus, the *Athenæa* of Athene, the *Thesmophoria* of Demeter, and the *Apaturia;* in November, the *Maimakteria* of Zeus; and in December, the lesser *Dionysia.* The Nemeseia was an ancestor feast; historic associations clustered about other festivals, while still others were nature-feasts. Great significance was acquired by the national feasts, of which the games and dramatic performances became the leading attractions. See Isthmus, Nemea; Olympia; Olympiad; Olympic Games; Pythian Games.

As in Greece, so in Italy, the festivals were in earlier times comparatively few in number. Among them were distinctly animistic feasts such as the *Lemuralia* and the *Feralia.* The Roman receptivity to foreign religious customs subsequently led to a great increase, and a constant fluctuation in their number. At the beginning of the Christian Era the most important were the following: In January, New Year's Day, the *Agonalia* and the *Carmentalia;* in February, the *Faunalia*, the *Lupercalia*, the *Quirinalia*, the *Feralia*, the *Terminalia*, the *Fugalia*, and the *Equiria;* in March, the *Matronalia*, the *Liberalia*, and the *Quinquatria;* in April, the *Megalesia*, the *Cerealia*, the *Palilia*, the *Vinalia*, the *Robigalia*, and the *Floralia;* in May, the *Lemuria*, and the *Ludi Martiales;* in June, the feast of *Semo Sancus*, the *Vestalia*, and the *Matralia;* in July the *Apollinaria* and *Neptunalia;* in August, the *Nemoralia*, the *Consualia*, the *Vinalia Rustica*, and the *Vulcanalia;* in September, the *Ludi Magni* in honor of Jupiter, Juno, and Minerva; in October, the *Meditrinalia*, the *Faunalia*, and the *Equiria;* in November, the *Epulum Jovis;* and in December, the last *Faunalia*, the *Opalia*, the *Saturnalia*, and the *Larentalia.* Under the emperors the number of festivals increased to such an extent that at one time there were more feast days than days of work. The Germanic nations had important festivals at the winter solstice and the vernal equinox, the Yule-tide devoted to Frey, the Easter to the goddes Ostara, and there are also traces of neomenia. Evidence of original ancestor-worship is found in connection with some Celtic and Slavonic feasts.

In ancient Egypt each nome had originally its own cycle of feasts, and the character of the festivities was determined by the nature of the divinity worshiped at its chief sanctuary. Lunar feasts in honor of the dead were apparently celebrated everywhere, and even the solar feasts were likely to be of an animistic character. Since the fertility of the soil depended wholly upon the inundations of the Nile, it is natural that its rising should be celebrated throughout the valley. Where worship of the solar deities forms so large a part of the religious life as in Egypt, and in the epic of the myths all other gods and departed spirits are brought into relation with them, it is natural that the life-producing energy of the sun should be bodied forth in symbolic acts. Sexual excesses were therefore apt to characterize especially the celebration of the great goddesses, Neith, Nut, Hathor, and Isis. In later times, however, a pantheistic philosophy and a mystic mood seem to have given the Isis festivals a more spiritual character.

In Babylonia each great sanctuary also developed its own calendar. Extant inscriptions do not give a full account of any system; but it is evident that some of the greatest festivals, such as the Zakmuk, or New Year's feast at the vernal equinox, and the Sacæa possibly at the summer solstice, were kept throughout the land. At the former, the destinies of men were fixed for the coming year. It seems to have been a Marduk festival. A procession between the neighboring shrines of Babylon and Borsippa took place at this time, and the King "seized the hands of Bel," by which ceremony he was formally installed as vicegerent of the god during the year. According to Berosus and Strabo the Sacæa had a Dionysiac character, and among the enjoyments it furnished was the crowning of a condemned criminal as mock king. For five days he had full license, and then was disrobed, scourged, and impaled. The five days are probably the *humustu* or intercalary days. At certain Ishtar feasts women sacrificed their virginity or offered themselves for the benefit of the goddess, according to Greek writers. A special significance seems to have been attached to the 7th, 14th, 19th, 21st, and 28th days of the month, according to an ancient calendar, and the term *shabattum* is explained in a lexical tablet as "day of the rest of the heart." It is therefore possible that the Sabbath is of Babylonian origin as a day when the heart of the gods was pacified by sacrifice. Whether it was observed by the ancient Canaanites and Phœnicians cannot be determined. (See SABBATH.) The clearest testimony concerning their festivals is found in the Hebrew records, since it was from these Semitic peoples that the invaders borrowed the agricultural festivals. The license that prevailed at the Ashtaroth and Adonis festivals is vouched for by many witnesses.

While South Arabian inscriptions are beginning to clear up the history of the peninsula before Mohammed (see MINÆANS; SABÆANS), we are still dependent upon Islamic writers for our knowledge of the festivals that were kept in that period. In spite of their misapprehensions, it is possible to discern the fact that the great festivals of the Muslim calendar are adaptations of pagan feasts, and even the manner of celebration is certainly a continuation of the old traditions. The great feast of ancient Arabia was in the spring, in the month called Rajab, during which, on account of this festival, cessation of hostilities between the tribes was ordained. This sacred season was originally fixed at the beginning of the summer, but the ignorance of astronomy in the earliest time, and the insistence upon a lunar year, caused the months to recede from year to year. At this time the firstlings were offered. Muharram was the first winter month, and its beginning marked the New Year with a festival at the autumnal equinox. The first ten days of the month are considered sacred by the Shiites and observed in commemoration of the martyrdom of Hosein. (See MOHAMMEDAN SECTS; HASAN AND HOSEIN.) The tenth of the month is generally observed throughout the Muslim world. The birthday of the Prophet in the third month is kept, and the 27th of the seventh month in commemoration of his supposed miraculous ascent to heaven. The first three days of Shawual, the tenth month, constitute the 'minor festival.' It follows immediately upon the end of the fast of Ramadan (the ninth month), and is a time of general rejoicing after the rigors of this season. (See RAMADAN.) On the tenth of Dhu'l Hijjah (the day of the sacrifice at Mecca; see HAJJ) begins the 'great festival,' lasting three or four days. The departure and return of the pilgrimage are also occasions of ceremony and rejoicing. Many other days have a local observance in honor of some great man or event. The method of keeping a Mohammedan holiday varies greatly. Public processions are often a prominent feature. Friday (el-Jumah) is frequently called the Mohammedan Sunday. It is the great day for public gathering at the mosque, but has no other point of resemblance to the Christian holy day.

Before their invasion of Palestine, the Hebrew tribes seem to have had one important annual festival, the Passover (q.v.). This *Pesach*, or leap-feast, so called probably from the gamboling of the young, was celebrated about the time of the vernal equinox, apparently by each household offering the firstlings of its flocks and herds. The recipients of these sacrifices may have been the household gods (*Elohim*), as even after the settlement in Palestine, when the people lived in houses and no longer in tents, they seem to have smeared the blood upon the threshold and the door-posts, where these guardian spirits were conceived to have their abode. It is probable that the festival of the new moon was also celebrated in this period; and the Feast of Sheep-Shearing may be of equal antiquity (I. Sam. xxv., 2; II. Sam. xiii. 23). When the different tribes had settled down to agriculture, they naturally learned of their new neighbors how to celebrate properly the harvest feasts, until then unknown to them. The great agricultural feasts were three in number. At the Feast of Unleavened Bread (called *Hag ham-mazzoth*, from *hag*, a dance, a pilgrimage, a festival, and *mazzoth*, cakes) the first-fruits of the barley harvest were presented to the local Baal or to Jehovah. Seven weeks later the Feast of Weeks was observed (*Hag shabu'oth* or *Hag haq-qasir; shabu'oth*, weeks; *qasir*, harvest) when the wheat crop had been gathered in. The time between these two feasts was a single festive season. In the autumn the Feast of Tabernacles came (*Hag has-sukkoth* or *Hag asiph; sukkoth*, booths, tents; *asiph*, gathering, harvest), "the ingathering at the year's end." This was on the occasion of the vintage and the olive-gathering. Its name was derived from the custom of living in groves and gardens in huts made of boughs. These booths were the scene of much merriment. Sacred dances were an important feature. At Shiloh the young maidens performed choral dances in the vineyards (Judges xxi., 19 sqq.). Eli's suspicion of Hannah shows how freely the wine was used even by women on these occasions (I. Sam. i. 14). The denunciations of the pre-exilic prophets reveal the essentially Dionysiac and licentious character of these festivals at the great shrines. To such an extent were drunken orgies and sexual indulgences characteristic features of these feasts, that men like Amos and Hosea, Isaiah and Jeremiah declared the sacrificial system and the temple cult contrary to the will of Jehovah. Concerning some early festivals our information is very scanty. Thus the Jephthah festival in Gilead, at which a virgin apparently was sacrificed, may have been either in honor of a virgin goddess, or more probably of the divinity who opens the womb, in order to insure the fertility of the tribe (Judges xi. 40). The centralization of the cult in Jerusalem and the attempted abolition of all sanctuaries outside of the capital in the reign of Josiah (B.C. 637-608) had a tendency at once to enchance the importance of the great festivals and to check the moral abuses associated with the rural feasts. But the destruction of Jerusalem and the end of the independent statehood of Judah naturally caused a revival of the local cults. That even some of the features most vehemently denounced by the prophets still continued in the fifth and fourth centuries B.C. is evident from Isaiah lvi.-lxvi. Having no temples, the exiles naturally put the more emphasis upon the keeping of the Sabbath, which was possible even in a foreign land; and it is significant that the insistence upon reform in the observance of the Sabbath was first made in Jerusalem by men born in Persia, such as Nehemiah and Ezra. All festivals are in this period given a historic significance. The ecclesiastical legislation did not recognize them as nature feasts, but as celebrations of Israel's deliverance from Egypt. New feasts appeared in the *Rosh hash-shanah*, or New Year's Day, and the *Yom Kippur*, or the day of Atonement, on the 1st and 10th of the seventh month respectively. In the Maccabæan period, the Dedication Feast was introduced to celebrate the reconsecration of the temple of Jehovah, on the 25th of Chislev, B.C. 165, after it had been for three years a Jupiter sanctuary (I. Macc. iv. 59). It is not likely to be an accident, however, that this event was celebrated at the time of the winter solstice. The recovery of the temple about that time of the year rendered it possible to dedicate to Jehovah a festival widely celebrated by pagan neighbors and probably also by emancipated Jews. Similarly the feast of Nicanor on the 13th of Adar, in celebration of the victory of Judas Maccabæus at Beth-horon in B.C. 161, was apparently an adaptation of an earlier festival in honor of the dead (I. Macc. vii. 49; II. Macc. xv. 36). Subsequently the Purim feast absorbed this Nicanor festival. The former seems to have been originally an Ishtar feast, celebrating the victory of this goddess and Marduk over the Elamitish divinity, Humba, conceived as a demon representing the nether world. In the Hebrew story told to commend the festival the names of the combatants in the Babylonian myth have been thinly disguised as Esther, Mordecai, and Haman, while in the actual celebration the ornamenting of the graves is most unimpeachable testimony to the worship of the dead once connected with it. As the Greek translation, according to the colophon, appears to have been made and brought to Egypt to introduce the Purim feast for the first time among the Jews living there in the year B.C. 45, the book of Esther and the institution of the festival among orthodox Jews in Palestine cannot have been much older. Whether the feast of the capture of the Akra (I. Macc. xiii. 50-52), no longer celebrated in the time of Josephus, likewise grew out of a nature festival cannot be determined. Equally unknown is the origin of the Feast of Wood-bringing (Josephus, *Bel. Jud.* ii. 17, 6) and of the Feast of the Rejoicing of the Law.

The attitude of Jesus to the feasts of His people seems to have resembled that of the earlier prophets. Concerning one of them only, the Sabbath, has His opinion been recorded. But His defense of His disciples when charged with breaking the Sabbath clearly reveals His position. "Man was not made for the sake of the Sabbath, but the Sabbath for the sake of man; therefore man has also authority over the Sabbath," is an assertion utterly at variance with the prevailing estimate of the day. Whether His last meal with His disciples was the paschal meal cannot be determined with certainty. These disciples no doubt continued to keep the Jewish festivals. Only as Christianity began to make converts outside of Judaism did the question of their observance become an important one. In the Epistle to the Galatians, Sabbaths, new moons, and other sacred days are regarded as shadows of the coming reality, and done away with in Christ, and the insistence upon Sabbath-keeping is looked upon as a sign of apostasy from the liberty of the Gospel. In the profound philosophy of the Fourth Gospel the festivals of the Jews find a symbolic interpretation. In Jewish-Christian circles, however, the Sabbath continued to be observed, as the *Apostolical Constitutions* and the canons of the Council of Laodicea show. A second-century gospel fragment in Coptic indicates that even the Jewish Passover was kept by Christians in Egypt. But gradually a number of Christian festivals came into vogue. It is not known how early the first day of the week began to be celebrated in honor of the resurrection. There is no trace of such an observance in the New Testament. For neither I. Cor. xvi. 2, where each person is bidden to lay by him, i.e. in his own house, as he is prospered, on the first day of the week; nor Acts xx. 7, where there is a breaking of bread on the last day of Paul's stay in Troas, as probably on the preceding ones; nor Rev. i. 10, where the Lord's Day seems to refer to the great judgment day, can be quoted as showing that the first day was distinguished from other days as having a sacred character. What day Pliny refers to in his letter to Trajan is uncertain. The first evidence of religious services upon the first day, because on it "God made the world and Jesus Christ rose from the dead," is found in Justin Martyr's *Apology*, written in A.D. 150. Whether the "venerable day of the sun" was first associated with the resurrection through the Mithra cult cannot yet be determined; but Constantine's decree, by which it was made a holiday for the Roman Empire, is couched in language that presupposes its general recognition as a sacred day. (See SABBATH; SUNDAY.) Through the Quartodeciman struggle a separate Christian festival distinct from the Passover developed in the second century, even though the Easter ritual preserved many features of the Jewish festival. (See EASTER.) While Origen still speaks of Pentecost as the whole season of seven weeks following Easter, the celebration of the outpouring of the spirit was in course of time placed at the end of this period. Clement of Alexandria is the first to mention the festival of the Epiphany. That of the Nativity was later. Both Jews and other nations were accustomed to celebrate the winter solstice. Christmas may therefore go back either to the Dedication Feast, to the Roman Saturnalia, or to the great winter festival of the Mithra cult. Subsequently it united with the Germanic Yule. The feast of the Ascension is not older than the fourth century. The great number of pagans entering the Church at that time, and the new character of Christianity as a State religion, caused many combinations of old festivals with the new ones. In the beginning of the sixth century attendance at church was made obligatory at Easter, Christmas, Epiphany, Ascension, Pentecost, Nativity, and Saint John, and later Annunciation, Purification, Assumption of the Virgin, Circumcision, Michael, and All Saints were added. Soon after, the ecclesiastical year was arranged in three cycles: Advent, Easter, and Pentecost. The process of assimilating pagan festivals still continued. According to the direction of Gregory the Great, feasts as well as temples were to be appropriated. Thus the Yule of the Germanic peoples and the Holiada of the Slavs were merged into Christmas, the feast in honor of the goddess Ostara united with the Passover, the Slavonic Kupulo feast blended with the midsummer festival in honor of Saint John the Baptist, and the Celtic carnival and Brandon feasts continued under the Christian régime. The Greek Church multiplied festivals in honor of the saints even faster than the Roman Church. It instituted the special day for the celebration of all the saints of the old law. The Coptic Church adopted seven great festivals: Christmas, Epiphany, Annunciation, Palm Sunday, Easter, Ascension, Pentecost. Toward the end of the Middle Ages earnest protests were made by leaders in the Church as well as by dissenters against the increase of festal days, both for economic and religious reasons. The partial or complete cessation of work took a disproportionate amount of time from every form of labor, and in spite of religious observances and prohibition of certain amusements, the leisure and gayety of these days naturally had a tendency to lead to excesses of different kinds.

The modern tendency in the Roman Catholic Church has accordingly been to reduce the number of holidays of obligation, i.e. those on which servile work is prohibited; not counting Sundays, there are only six in the year in the United States. On the other hand, there has been a great increase in the total number of festivals, with the development of certain devotions and the gradual enlargement of the calendar. They are divided ritually into doubles, semi-doubles, and simples, the first being those in which the antiphons (q.v.) at lauds and vespers are doubled, and including doubles of the first and second class, greater and lesser doubles. Doubles of the first class are frequently accompanied by octaves, i.e. the seven days after the feast are kept with corresponding ritual observances.

The only feast day retained by all the Churches of the Reformation was Sunday (q.v.). The Church of England made fewer changes in the calendar than any other, retaining in addition to Easter, Christmas, Ascension, and Whitsunday, Trinity Sunday, the Circumcision, the Epiphany, the Purification and Annunciation of the Blessed Virgin, the Nativity of Saint John Baptist, All Saints, Saint Michael, and All Angels, feasts of all the Apostles and Evangelists. Lutheran churches retained the feasts of the New Year, Epiphany, Annunciation, Palm Sunday, Easter, Ascension, Pentecost, Saint John the Baptist, and Christmas. At Easter, Pentecost, and Christmas two days are kept. Presbyterians and other reformed bodies recognized no holy day, except Sunday, which is regarded as the Christian Sabbath. The Westminster Assembly of 1645 declared that there is no warrant in the Word of God for any other festival.

At the time of the French Revolution an attempt was made to reform the calendar by substituting a ten-day week for that of seven days, and the celebration of other events, personalities, and virtues for those emphasized by the Church. But it had no permanent success. The separation of Church and State in the United States, and the principle of religious liberty widely recognized in Europe, during the last century have raised many new questions concerning the sacred days. Where civil society can no longer take cognizance of the conceived sanctity of any day, but only guarantee that no citizen shall be disturbed at any time in his religious exercises, new grounds must be found for legislation affecting holidays. While absolute cessation from labor cannot be enjoined without infringing upon the liberties of the individual, the duty of society to protect its weaker members has been invoked to justify legislative measures securing to all the privilege of periodic rest. In some countries the public libraries, museums, art galleries, and theatres are open on holidays; in others, the labor necessarily involved is urged as the reason for prohibiting all educational and artistic exhibits. It is held by many sociologists that, as only a regularly recurring period of rest and recreation seems to be required, all legitimate needs may be met, without interruption of the world's work, its educational opportunities, and its artistic enjoyments, by an alternation of working forces.

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FESTOON (Fr. *feston*, ML. *festo*, festal garland, from *festum*, feast). In architecture, a sculptured wreath or garland of flowers or fruit, intertwined usually with representations of ribbons, frequently used as an ornament in Roman and Renaissance buildings. Like many of the other ornaments of classic architecture, it owes its origin to one of the sacrificial emblems, viz. the flowers with which the heads of the animals, the altars, etc., used to be decorated, and which were first used in permanent sculptured form on the altars, suspended from the *bucranes* (q.v.). The festoon occurs along with bulls' heads on the frieze of the temple of Vesta at Tivoli. A beautiful early Renaissance example is on the tomb of Ilaria del Carreto by Jacopo della Quercia (q.v.), and a more original one is by Michelangelo in the small sacristy of Santa Lorenzo. The Renaissance festoons are often held up by cupids, instead of animals' heads.

FESTU'CA. See FESCUE.

FES'TUS. A dramatic poem by Philip James Bailey (1839).

FESTUS, PORCIUS. Procurator of Judea from A.D. 58 to 62, though as regards these dates, especially that of the appointment, there is considerable discussion. Festus succeeded Felix (q.v.), and was in turn succeeded by Albinus. His term of office was not marked by any events of note beyond (1) the settling by the Emperor against the Jews of the dispute between the Jewish and Syrian inhabitants of Cæsarea regarding their civic privileges—a dispute which had come over from the time of Felix, of whose removal from office, in fact, it had been the cause (see FELIX); and (2) the controversy between Agrippa II. and the priests in Jerusalem regarding the wall erected at the temple to break the view of the new wing of Agrippa's palace—a controversy in which Festus took the side of Agrippa, but which was appealed to Rome by the priests, Festus dying before the decision was known. In both these events, but especially in the former, Jewish hostility to Rome was greatly inflamed, and feelings were aroused which played an important part in the closely following Jewish War of A.D. 66.

It was before Festus that Paul, who had been left a prisoner by Felix, had his final hearing. On this occasion Festus, for the sake of pleasing the Jews, sought to induce Paul to go to Jerusalem for trial, in opposition to which suggestion the Apostle appealed to Cæsar. This appeal resulted in Paul's deportation to Rome in the autumn of A.D. 58 (Acts xxv.-xxvi.). See PAUL.

FESTUS, SEXTUS POMPEIUS. A Latin lexicographer of the second century of our era, and one of the most important ancient authorities we have on the Latin language. He made an epitome of the great work of Verrius Flaccus, *De Verborum Significatu*. This compilation, which was arranged alphabetically in twenty books, was still further abridged in the end of the eighth century by Paul, son of Warnefried, commonly called Paulus Diaconus. The great work of Flaccus has unfortunately entirely perished, and of the abridgment made by Festus only a single manuscript, and that in a deplorably imperfect condition, has survived. It came from Illyria, and fell into the hands of Pomponius Lætus, a distinguished scholar of the fifteenth century. It ultimately passed into the library of Cardinal Farnese, at Parma, and is now preserved at Naples. The work, in spite of all its imperfections, is a storehouse of knowledge on points of mythology, grammar, and antiquities. All previous editions of Festus were of little value compared with that of Müller (Leipzig, 1880), but this is now superseded by the later edition of Thewrewk de Ponor (Budapest, 1889).

FET, really SHENSHIN, AFANSIY AFANSIYEVITCH (1820-92). A Russian lyric poet. He was born in the Government of Orel. He entered first the faculty of law, and later that of philology, in the Moscow University, but soon joined the army and served in the Russo-Turkish War of 1853-56. Owing to difficulties with the family papers, he assumed his mother's name, Fet, under which he was known until 1875, when officially allowed to resume his real name, Shenshin. His first volume of poems, the *Lyric Pantheon* (1840), was highly successful. In 1860 he became an agriculturist in a country place. Then for nearly two decades he only occasionally contributed articles on agriculture under the title *From the Country*. In 1877 he settled in the Government of Kursk, and published a series of masterly translations of the Roman poets (Horace, Vergil, Catullus, Ovid, Tibullus, Propertius, Juvenal), translating also into Russian *Faust* and Schopenhauer's *The World as Will and Idea*.

FETI, fā'tē, DOMENICO (called MANTUANO, from the fact that his chief works were executed at Mantua) (1589-1624). An Italian painter, born in Rome. He was a pupil of Lorenzo Cardi, called Cigoli. Ferdinand Gonzaga, Duke of Mantua, appointed him Court painter. He painted a number of frescoes and works in oil in the cathedral there, and then went to Venice, where he died, the victim of his intemperance. Feti had considerable ability, but his pictures, though in many cases powerful in coloring, possess little style, being often ill-managed as to light and shade; and the vulgarity of his nature prevented his religious works from being of a high class. His paintings are well distributed through the galleries of Europe; Dresden has eleven of them. The more notable are "David with the Head of Goliath," "The Flight into Egypt," "The Good Samaritan," "The Parable of the Wine," and "Meditation."

FETIALES, fē'shĭ-ā'lēz (Lat., speakers, from *fari*, Gk. *φάναι*, *phanai*, to speak). Roman priests who acted in international affairs as heralds in the announcement of war to a foreign State, and who presided over the solemnities attending the return of peace. Their duties were discharged with much ceremony. They were anciently citizens of high birth, were chosen for life, and were called *patres patrati*.

FETID WOOD-WITCH. See FUNGI, EDIBLE AND POISONOUS.

FÉTIS, fā'tēs', FRANÇOIS JOSEPH (1784-1871). A Belgian composer and writer on music. He was the son of an organist, and played the organ in his native town (Mons) when only ten years of age. He received his musical education in Paris and then traveled in Germany and Italy, studying the works of the great masters. In 1806 he returned to Paris, married a wealthy woman, and was enabled to devote his time to studying the history of music. In 1813 financial misfortunes compelled him to accept the position of organist and instructor in Douai. In 1821 he became professor in the Conservatory of Paris, and published three years later his *Traité du contrepoint et de la fugue*. In 1827 he founded the *Revue Musicale*, a journal devoted to musical criticism. In 1833 he was appointed director of the Royal Conservatory of Brussels. The most successful of his operas was *La vieille* (1826), which had a run of one hundred nights; besides, he wrote much sacred and instrumental music. His principal works are: *Biographie universelle des musiciens et bibliographie générale de la musique*, in 8 vols. (2d ed. 1860-65); *Histoire générale de la musique* (5 vols., 1869-75), reaching down to the fifteenth century only; and *Traité complet de la théorie et de la pratique de l'harmonie* (11th ed. 1875). Consult Alvin, *Notice sur F. J. Fétis* (Brussels, 1874).

FE'TISHISM (from *fetish*, Fr. *fétiche*, from Port. *feitiço*, artificial, from Lat. *facticius*, made by art, from *facere*, to make; the term was originally applied by Portuguese pioneers in western Africa to artifacts adored by the natives and supposed by them to possess magical potency). A form of belief and fiducial practice in which supernatural attributes are imputed to material objects, especially objects of artificial character; the practice includes sorcery, thaumaturgy, or magic, with various attendant ceremonies and minor observances. The fetish is usually a figure modeled or carved from clay, stone, wood, or other material in imitation of some deified animal or other object; frequently it consists of fur, feathers, hair, bone, or tooth of a tutelary animal; sometimes it is the animal itself, or some tree, rock, river, or place associated with the tutelary in the mind of the devotee; and in certain cases the belief is so definitely crystallized about the object itself that the customary connection with the tutelary eludes detection—when the belief may be said to grade into idolatry. First noted by Portuguese travelers in Africa, it is now recognized that fetishism is by no means confined to western Africa, but prevails among the primitive peoples of all lands; also that the belief represents a fairly definite stage in the development of fiducial notions and practices. Tylor justly limited fetishism to the doctrine of potencies (or spirits) attached to, or conveying influence through, material objects, in contradistinction from animism, which he defined as the doctrine of spirits in general, and also indicated the way in which fetishism grades into idolatry. Briefly, fetishism usually arises in the primordial belief called by Powell 'hecastotheism,' and accompanies the succeeding stage of zoötheism, to die out in the idolatry preceding the development of spiritualized faiths. Significant vestiges of the early belief persisted among the ancient Greeks, who reverenced trees and sacred places; the Romans, who cast clods of native earth on the site of the sacred city; the Druids of England, who adored oak and mistletoe; the early Germans and Celts with faith in fairies, and many other peoples. See Man, Science of; Sophiology.

FET'LOCK, or **FETTERLOCK.** In heraldry, a form of padlock. Edward IV. of England adopted this as a charge after the battle of Mortimer's Cross, in 1471.

FEU (from OF. *feu, fieu, fied, fief*, fee, from ML. *feudum*, property held in fee). In the law of Scotland, a right to the use and employment of lands, houses, or other heritable objects, in perpetuity, in consideration of an annual payment in grain or money, called *feu-duty*, and certain other contingent burdens called casualties of superiority. Though 'feu' was, like 'feud' and 'fee' in English law, formerly used to express any kind of tenure by which the relation of lord and vassal was constituted, in its narrower meaning which we have here indicated, and which is that in which it is now almost exclusively used, it was opposed, on the one hand, to those tenures in which the return consisted of military or other personal service, and, on the other, to those in which the return was illusory, the only object of which was to preserve the relation of superior and vassal. A feu, in short, was a perpetual lease—a feu-farm, as it was often called—by which the tenant became bound to pay a substantial consideration, and his rights under which he might forfeit, as the penalty of nonpayment. In the present day the disposal of land in feu is practically a sale for a stipulated annual payment, equivalent to chief rent. It is in this light, accordingly, that feus are generally regarded in Scotland; and though feus resemble English freeholds in substance, their forms agree mostly with copyhold tenure. See Paterson, *Compendium of English and Scotch Law.*

FEUCHTERSLEBEN, foiк'tērs-lā'ben, Ernst, Baron von (1806-49). An Austrian physician, philosopher, and poet, born in Vienna. He studied in the university of that city, became lecturer there in 1844, and was made Under-Secretary in the Ministry of Public Instruction in 1848, but resigned in the same year. His *Lehrbuch der ärztlichen Seelenkunde* (1845) was translated into English, and others of his attractively written medico-philosophical works enjoyed a high reputation. He is, however, best known by his *Zur Diätetik der Seele* (1838), which is still widely read. His non-medical works, with a biography (7 vols.), were published in 1851-53. Some of his lyric and didactic verses appear in most anthologies.

FEUD (AS. *fæhþ*, enmity, from *fāh*, hostile, OHG. *fēheda*, Ger. *Fehde*, hatred, OIr. *ólch*, enemy, Lith. *pìptas*, bad, OPruss. *popaikā*, he deceives). A war waged by one family or small tribe on another, to avenge the death or injury of one of its members. It prevailed extensively among the nations of northern Europe; and it was only by gradual steps that the practice was first restricted and then abolished. The laws of the Emperor Rudolph I. recognized the right of waging feuds. At last, partial associations were formed, the members of which bound themselves mutually to settle their differences by courts of arbitration and compensation, without going to war. The practice, however, continued in many parts of the world, and has survived to the present day in the feuds of the Kentucky and Tennessee mountains in America, and in the Corsican *vendetta.*

FEUD (in law). See Fee.

FEUDAL ARCHITECTURE. A term applied to architecture during the Feudal Age; that is, from about the tenth century to the fifteenth. (See Gothic Architecture; Romanesque Architecture.) It is generally used in reference to the military architecture of that period, which will be found treated under Castle.

FEUDALISM (Fr. *féodalisme*, Sp., Port., It. *feudalismo*, from ML. *feudum*, Eng. *feud*, from OHG. *fihu*, AS. *feoh*, cattle, Lat. *pecu*, Skt. *paśu*, cattle). The name used for a group of customs, embracing the political and economic sides of life, which gave to society its characteristic shape during the greater part of the Middle Ages. The rise of the institutions which we call feudal became noticeable shortly after the Germanic invasions, and they attained their highest development from the ninth to the thirteenth century. With the beginning of the fourteenth century certain non-feudal institutions appeared, and gradually a more modern type of society began to take form. These changes, slow at first, became more rapid and fundamental until eventually the feudal system, as such, was quite overthrown, though certain customs lingered far down into modern times, and in some few respects still exercise considerable influence in various countries. Feudalism, therefore, must be studied in its origin, its period of highest development, and its decline; and in the examination of the chief features of the system, attention must be paid to the way in which it affected (1) personal relationship; (2) landholding; and (3) the distribution of political power.

THE ORIGINS OF FEUDALISM. (1) *Personal Relationship.*—Amid the disorders and insecurity of the early mediæval period it became very usual for men of low rank and little strength to 'commend' themselves to men of higher position and greater power. This 'commendation' might be to the King, in which case an additional and closer bond was created than that between ruler and subject; or it might be to a noble or a church corporation, or even merely from one freeman to another. Commendation tended to become a formal procedure accompanied by an oath of fealty and service from the inferior to the superior. The relationship thus established was known as that between vassal and suzerain, or man and lord, and the ceremony as 'homage and fealty.'

(2) *Landholding Relationships.*—Landed estates were frequently granted by kings, or other possessors of extensive landed property, to persons who should hold these estates for their own use, but should, in acknowledgment of having received them, perform certain services, or make certain payments, to the grantor. In early times such grants do not seem to have been considered as hereditary, but they tended to become so. Rulers obtained lands to be thus disposed of by conquest and confiscation; men of lower rank received such extensive royal grants that they were in a position to make similar grants on a smaller scale to others. During the same period many holders of land in full ownership gave it to powerful persons or bodies, especially to the Church, taking it back for possession during their own lifetime, or during the lives of a certain number of heirs. Such a grant was called a 'precarium,' and was often held in practically hereditary tenure by the original donor and his successors, although the ultimate title to it was vested in a third person or corporation. In these ways there came to be but little land that was actually owned by the person who occupied it, and but little that was directly claimed by the person who received payments from it. Land had come to be 'held' by one man from another, and land 'tenure' had taken the place of land 'ownership.' A piece of land held in this way was called a 'fief,' a 'fee,' or a 'feud'; the procedure by which it was granted was known as 'enfeoffment,' and the relation between the person holding it and the person from whom it was held as that between landlord and tenant. See FEE; FEOFFMENT.

Next, it is to be noted that the personal bond of homage and fealty and the relation of landlord and tenant tended to run together. Men usually 'commended' themselves to the lord from whom they held their land; a person receiving a fief from the King was both his tenant and his vassal; and when a landholder enfeoffed a tenant he usually received an oath of homage and fealty from him. The conception of vassalage and tenancy became inseparably bound up together. Sometimes, it is true, a fief consisted of something else than land. It might be an office or even a regular income, held on condition of fealty, homage, and feudal service; but after the tenth century, in most western countries of Europe, the possession of any considerable holding of land without the accompaniment of personal homage and fealty to some lord was almost unknown.

(3) *Powers of Government.*—Large monarchies, under the conditions existing in the early Middle Ages, could only be governed by placing their different sections or provinces under governors or viceroys. In the Empire of the Franks these were known as counts; in England, as earls. When the King was a strong man, and his government well organized and orderly, the governors were appointed officials with limited powers and a temporary, or at most a life tenure of office. During the disorders of the ninth and tenth centuries, however, the provincial rulers obtained extensive local powers. They exercised such functions of government as taxation, the raising of military forces, the administration of justice, and the coinage of money. Moreover, their positions came to be looked upon and treated as hereditary. In many cases their power was strengthened by the fact that the district over which the count ruled had been occupied earlier by an independent race or tribe, and had been brought into the monarchy only by conquest or annexation. The surviving race-feeling, therefore, now attached itself to the local ruler. In addition the semi-independent political powers of these rulers over whole districts were closely combined with the personal and landholding relationships already described. Men naturally commended themselves to the nearest powerful lord, and performed the services due for their land to him. Ecclesiastical bodies, bishoprics, and abbeys, which were the holders of such a large proportion of the land, and whose estates were considered as being held feudally, were naturally dependent upon the good will of the local ruler to defend them from the attacks of others, and to refrain from aggression upon them himself. These rulers also had lands in their possession which they granted out as fiefs to be held from themselves by persons who were thus alike their subjects, their tenants, and their vassals. Thus, in the case of these great lords of whole districts, political powers, the rights of a feudal landlord, and personal lordship were inseparably combined. It is this close union of the powers included under the modern conception of government with a system of landholding and with personal relations of fealty that forms the fundamental character of feudalism, and lies at the base of the legal institutions of the Middle Ages. In the great lordships, at first, a fief involved not only the possession of land and of personal claims and duties, but of most of the important rights of government over the persons dwelling on the land.

In the course of time the same conditions came to prevail in a partial degree in smaller lordships too. When the King gave away land, he frequently granted to the new holder all kinds of claims which he possessed over the people dwelling on the land. In the ninth and tenth centuries, for instance, the King in many cases, especially in land granted to the Church, promised that royal officials should not intrude, in the future, upon the land for purposes of taxation, administration of justice, or military levy. This left it open to the landholder to exercise those rights upon his tenants, who thus became practically his subjects as well. Such royal grants were known as 'grants of immunity,' or 'immunities.' In England similar grants were made in late Anglo-Saxon times, reciting the privileges of 'sac and soc,' 'toll and team,' and other franchises now imperfectly understood. Sometimes only partial rights of government were given in the immunities, as where the King granted all pecuniary profits from court jurisdictions over a certain district, but did not give any other powers. Ultimately, as feudal conditions became so nearly universal, it was considered that landholding in itself involved the possession of certain political rights over the tenants of the land, the extent of these rights being dependent on the customs or circumstances of each particular case. And in this manner, in the lower as well as in the higher grades of holding of landed estates, there was the same union of proprietorship of the land, lordships over vassals, and rights of sovereignty over inhabitants. In the creation of this complex mass of personal and territorial relations, there was much that was a matter of voluntary choice, but still more that was the result of the exercise of compulsion. The early Middle Ages were a period of violence and disorder, and feudalism was rather a resultant from the conflict of different forces than any planned or logical scheme. Nevertheless a certain equilibrium was reached, if it was only the recognition of the common interests of oppressor and oppressed, of the powerful and the weak; in spite of a thousand variations, from country to country, from estate to estate, from person to person, there was a certain amount of uniformity. It is this degree of consistency which has suggested and partially justified the use of the term 'feudal system,' and taking it in this sense, it is possible to give an approximate description of this general body of feudal customs.

The Feudal System. About the thirteenth century a number of treatises or codifications of feudal law and customs were drawn up, such as that of Beaumanior and other similar *Coutumiers* in France, the *Sachsenspiegel* and *Schwabenspiegel* in Germany, and the *Libri Feudorum* in Italy. The appearance of these feudal codes, as well as other facts arising from a direct study of institutions, seems to point to the thirteenth century as the culminating period of feudalism, though the course of its development was very different in different countries. From the point of view of landholding, feudalism was most complete in England, due doubtless to the occurrence, just in the constructive period of feudal institutions, of the Norman Conquest with its accompanying confiscations and regrants. Independent political powers were developed most completely in Germany or Italy, but on the whole feudalism had its most symmetrical development in France, and it is there studied most satisfactorily as a complete system.

The base of the whole structure was the fief. A fief was a body of land; it might be made up of a large stretch of contiguous territory or of many separate tracts, or it might be a single estate, or even possibly a comparatively small number of acres in a certain manor or township, which a tenant held from his lord on condition of certain 'feudal' services. When the fief was first granted, or when it was obtained by inheritance, or when a new lord succeeded to the suzerainty, a ceremonial 'investiture' took place according to the traditional forms of the ceremony of fealty and homage. The tenant kneeled before the lord, placed his clasped hands between the hands of his lord, and in this attitude swore to be his man and to preserve fidelity to him in all things. The lord accepted the fealty and homage by kissing the tenant and inferentially promising him his protection and patronage, and by conveying to him, frequently by some symbolic action, the fief of which the vassal now became possessor.

The services owed by the tenant were of the following general classes: Military service was the duty of serving his lord in war with a certain number of men for a certain time; according to a widespread custom, once a year and for forty days. So general was this duty that feudal tenure is frequently called military tenure. Court service was the twofold duty of coming when summoned to be a member of a body to decide in cases concerning one of his 'peers' or fellow vassals of the same lord, and of submitting himself to the jurisdiction of such a court or of his lord. 'Wardship' is the term applied to the right of the lord to assume the guardianship of the minor heir of a deceased tenant and the income from the estate during the minority, with the requirement, however, that the proper support and education of the heir be provided for from the estate. 'Marriage' similarly was the right of the lord to control the choice of a husband for the heiress or the widow of a tenant, and frequently of a wife for the heir. These last two forms of service reduced themselves practically to the imposition of a money fee proportionate to the value of the estate concerned. Military service also was frequently transformed into a money payment. There were other direct money payments, although usually at quite uncertain intervals. Of these, 'relief' was a money fee due from an heir on the acquisition of his property. It was very commonly estimated at a sum equal to the value of one year's income of the estate. 'Aids' were payments of an amount settled by custom under three contingencies: (1) to defray the expenses of knighting the lord's eldest son; (2) of the marriage of his daughter; (3) of his ransom in case he were captured in war. These were seldom exacted by any feudal lord except the King, and by him only from his direct tenants or tenants-in-chief; but these in such a case might call upon their tenants to reimburse them for what they had paid to the King. Finally, 'escheat' and 'forfeiture' were the conditions in which the fief could be taken back by the lord, the former in the case where there was no heir, the latter in the case where the tenant had failed in the performance of his feudal obligations. 'Sub-infeudation' is a term used to describe the grant of a portion of a tenant's holding to another person, to hold from him on similar terms to those on which the first tenant holds from his lord. Generally speaking, all the land of a country was held from the King by a comparatively small number of direct tenants, known as tenants *in capite*, or *in chief*. Many of these had very large fiefs consisting of a vast number of estates. They granted some portions of their holdings, as lesser fiefs, to others, and these a still further portion to others below them, and so on till there were frequently six, eight, or more *mesne* or 'mean' lords between the actual tenant of a certain estate and the King from whom it was ultimately held. All tenants below those *in capite* were known as 'sub-tenants.'

Feudal Society. The people were divided, according to contemporary writers, into three classes: those who did the fighting, the nobles; those who did the praying, the clergy; and those who did the work. The nobles were necessarily warriors. In order to be able to devote themselves to fighting, they were obliged to have an income sufficient for their support, and for equipping themselves and their followers when they went to battle. They were the owners of the estate, which will be described below when the workers are treated of. The rank of a noble depended upon the extent of his possessions. The rulers of provinces who could lead immense bands to war were designated as dukes, marquises, or counts. Below these were barons and knights, who held varying amounts of property which enabled some to lead large troops of followers to battle; others were under the necessity of serving in the following of some more wealthy noble, usually the one from whom they held their fief. Lowest of all were the squires, or attendants upon the knights, who at first had no land, but later acquired large estates. They formed the great mass of the nobility in the thirteenth century. The home of the noble was his castle. There he lived as a petty monarch, exercising authority over his vassals and tenants. When he was not engaged in war he devoted himself to the management of his fief or to hunting. The management involved more than merely looking after the property; for the lord had the executive, judicial, and administrative powers all in his own hands. He had to hold courts, administer justice, and police his fief. Hunting was not merely a pastime, but one of the chief means of supplying food for the table.

The noble's wife (châtelaine) had charge of the household, and superintending the work of the maids, who did the spinning and weaving. She had to know something of medicine and nursing, as the care of the wounded and sick devolved upon her. In her husband's absence she was obliged frequently to take his place in defending the castle or administering the fief. In her leisure moments she might embroider tapestries or play chess; such are the occupations generally depicted in the *chansons;* but in reality the lady usually was busy with her household duties or in making clothes. The bunch of keys which she wore at her girdle was the fitting emblem of her duties. The education of the daughter of a noble was devoted wholly to giving her a knowledge of the duties which she would be expected to perform. (The education of the son has been discussed under Chivalry). With the acquisition of wealth, after the twelfth century, games, minstrelsy, and tournaments became common. Prodigality was the prevailing characteristic of the age, and soon impoverished most of the nobles. Even in this age, which is glorified by the poets, luxury and lack of comfort went hand in hand. At the gorgeous festivals in the castles many things which we now consider necessaries were wholly lacking.

The members of the clergy were originally either nobles or peasants. Their duty was to pray, and to care for the moral welfare of the society. As a rule they were somewhat better educated than the other members of the community. The bishops and the abbots were great landholders, and had the same responsibilities as the lay nobles, from whose life their own often differed but little. At the other extreme of the clerical body were the village priests, who had sprung from the people, and shared the lot of the latter.

Those who did the work were the peasants. They were obliged to support not merely themselves, but also the nobles and clergy, by whom they were generally despised. They lived usually in villages, about which stretched the lands which they cultivated. Some of the peasants were freemen; others, serfs. In fact, there were many gradations in social rank according to the amount of freedom which each class possessed. Here we can notice only the two general classes. The freemen held land from the lord of the fief which could not legally be taken from them. For this they paid a fixed rent which could not be increased by the lord. The serfs also had holdings of lands which could not be taken from them; but as payment for their lands they owed personal services and a part of their crops to the lord of the fief. He, or his representative, lived in a castle or fortified house a little apart from the village. Near the castle was a tract of land which the lord kept in his own possession, to be worked by the peasants for his profit. The remainder of the land was divided into long, narrow strips held by the peasants, no peasant, however, being allowed to hold a number of adjacent strips. The cultivation of the land was carried on in common by the holders of neighboring strips. The villagers were bound closely together by their common work and mutual responsibility, for each village was collectively responsible for the order within its limits. See Manor.

Some of the villages grew into towns by the erection of fortresses or because of their favorable location for trade. The towns were, like the villages, the property of some lord or lords. But the townspeople were usually engaged in manufacturing or trade, and thus obtained wealth. Consequently, they were able to form effective associations (see Guilds), which bought or usurped the rights which the lords possessed to collect payments from them. Many obtained charters of liberties, and became almost self-governing communities. Individual merchants acquired wealth, and vied with the nobles in luxury and ostentation. The members of the 'third estate,' as the townspeople came to be called, secured representation in the national assemblies, and gradually emerged from their despised condition to become the real backbone of the nations.

Military Organizations. The element of personal relationship, which is the main characteristic of the feudal system, affected to a marked degree the organization even of the mediæval army. The fighting force under feudal conditions was marked by four main characteristics: (1) Its members were a military class; (2) they fought as cavalry; (3) they were grouped in small irregular units; and (4) they fought almost without strategy or tactics. The first of these characteristics arose from the fact that all military service was provided as a return made by a vassal for the grant of land. When land was granted by kings and great nobles to vassals on condition of military service, the capacity to furnish this service when demanded was requisite, and therefore men with military training and equipment were a necessity. Military service was also doubtless a source of pleasure and a matter of pride, since the fighting class was also the landholding and the ruling class. (2) The fact that a feudal army was a mounted body arose from the nature of the times in which feudalism arose. In the ninth and tenth centuries, Northmen, Magyars, and Saracens were in the various parts of Europe making rapid forays into the old settled regions, and to meet them successfully it was necessary to have a force that could move as rapidly as they. Therefore the counts and kings who were engaged in defending their territory against these invaders substituted mounted troops for the foot soldiers employed formerly in the civil wars, or in the invasions of the Roman Empire. There were some foot troops usually included in a feudal army, but their employment in fighting was quite subordinate. An important exception to this, however, was the case of England, where the archers from a very early time constituted a valuable part of the field forces, and repeatedly showed themselves superior to the chivalry of France. (3) The third characteristic, the lack of a hierarchy of leaders, and of a series of divisions and subdivisions of the parts of an army, arose from the way in which it was recruited. Each count, baron, or gentleman brought with him a smaller or larger group of knights, and continued to act as the leader of his group during the fighting. The only regularity was in cases where the lesser knights and esquires were brought to an engagement in squads under the leadership of royal officials. But in most countries these were a small part only of the whole body of fighting men. Any such arrangement as the modern divisions of brigades, regiments, and companies was entirely unknown and inapplicable to the prevalent style of fighting. (4) With this organization, or lack of organization, there could be no system of tactics. There was usually some crude grouping of the whole body of troops into two or three 'battles,' under different leaders; but as a matter of fact the fighting men usually began the onset as soon as they came in sight of the enemy, and the engagement rapidly became a mere mêlée, or series of separate encounters. Fine personal valor and great personal skill and strength were often displayed in such contests; but the army as a whole was very ineffective. Similarly strategy or planning for a large campaign usually consisted simply in passing into the enemy's country and, while rather languidly seeking an engagement, burning and plundering the property of the enemy's subjects. The great feudal weapons were the lance and battle-axe, with some use of the sword. (See BATTLE-AXE.) There was a development of body protection from the mere coat of mail and headpiece of full plate armor. See ARMOR; BREASTPLATE; CHAIN MAIL; HELMET; and SHIELD.

Such feudal armies were characteristic of the eleventh, twelfth, and thirteenth centuries. The Crusades made less change in warfare than might have been anticipated, the Western armies remaining much the same in organization. By the fourteenth century, however, some new elements were grafted on this system. Hired bands of mercenaries were largely employed (see BRABANÇONS and CONDOTTIERI), and these were somewhat better organized and handled. Certain new troops were used, or old forms brought into a new prominence. The Swiss pikemen and halberdiers, fighting in a solid phalanx, frequently overwhelmed a more purely feudal army of armored cavalry, especially when the fighting was in a mountainous country. The English bowmen, armed with the rapidly discharged and effective longbow, were used in connection with heavy-armed cavalry and men-at-arms. Their rapid and deadly flight of arrows threw into confusion any stationary body of feudal troops opposed to them, and put this body at the mercy of the knights whom the archers were supporting. If the opposing cavalry force was charging, the arrows retarded their advance so much as to make its onset ineffective. The effort to meet these new conditions or to utilize them to the best advantage, along with the other influences of the time, gradually led to a diversification of tactics, and eventually to the organization of the modern type of armies. The invention of gunpowder and its gradual introduction in warfare was rather an element in the gradual development of modern military systems than a source of any sudden change.

THE DECAY OF FEUDALISM. Feudalism was in its very nature anarchic. The possession of military power was an incitement to its use in the settlement of private feuds; the imperfect subjection of vassals only slightly less powerful than their lords led to frequent resistance on their part; the absence of a strong central government, resulting from the possession of sovereign rights by the nobles, diminished the salutary power of enforcing order from above. The feudal castle, fortified and guarded, held in the name of the ruler, but frequently used as a base of operations to despoil and tyrannize over the surrounding country, and to wage petty warfare with other feudal nobles, was as characteristic an element of feudalism as were the legal and economic features which have been described above. During the latter part of the Middle Ages, from the thirteenth century onward, other institutions were being developed which did not fit into the feudal system. Town life, trade, and commerce, a well-to-do free middle class, and strong centralized monarchies grew up in the various Western countries, so that feudalism became restricted to a less and less extensive proportion of human interests. Even in those fields in which feudalism had been dominant, in landholding, personal relations, and the powers of government, fundamental changes were taking place. Land came to be generally held on condition of mere pecuniary payments, and became a subject of purchase, sale, and bequest. Contractual relations, and those of subject and sovereign, took the place of the personal bond of earlier times. Military powers, the right of taxation, the right of coinage, even the right of court jurisdiction were withdrawn by the national governments from the feudal barons. During the thirteenth century in England, the fourteenth in France, and the fifteenth in Germany, the kings were able to put an end to private warfare, and to reduce feudal jurisdiction to a definite inferiority to that of the King. Notwithstanding the decay of feudalism in these respects, however, class distinctions based upon it, certain privileges of taxation, and peculiarities of landholding continued to exist until in France they were swept away by the Revolution, in 1789, while in Germany and England traces of their influence may still be found.

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FEUDAL SYSTEM. See FEUDALISM.

FEUDAL TENURE. The system by which land was generally held in western Europe during the Middle Ages. It allowed one man to hold the title while the use belonged to some one else. The former was known as the lord or suzerain, while the latter was the vassal, and owed service for the land. If the vassal was a noble, his service was generally of a military nature, while if he was a villein, his service was usually in the form of work on his lord's estate. The noble's land was known as a fief (q.v.), and there was nothing to prevent him from holding of several lords, but the one to whom he owed service primarily was known as liege lord. In some parts of Europe the feudal system had made little or no headway. Here property was held in fee simple, which was known as allodial tenure, and the separate estate was the allodium. See FEUDALISM.

FEU DE JOIE, fẽ de zhwä (Fr., fire of joy). A form of musketry fire reserved for the celebration of some joyful event, as, for example, the observance of the King of England's birthday in the British Army. The troops are formed in line, in two ranks, at open order. On the command *present,* rifles are brought to that position, with the muzzles pointing upward, care being taken to secure a uniform angle of elevation. On the command *fire,* the right-hand man of the front rank discharges his rifle, followed at scarcely perceptible intervals by the men on his left successively. When the extreme left of the front rank is reached, the left-hand man of the rear rank immediately follows, the fire being similarly continued until the extreme right is attained, when the round is completed. Three rounds, as a rule, are fired on such occasions. The random or independent discharge of firearms in the air, common to Indians, and other uncivilized bodies of warriors, might be termed a feu de joie.

FEUERBACH, foi'ẽr-bäG, ANSELM VON (1829-80). A German historical painter, born at Speyer, the son of the archæologist Anselm Feuerbach (1798-1851). His artistic proclivities having been early awakened in the course of his education at Freiburg (1836-46), he went to Düsseldorf in 1846, where he studied under Schadow, and later to Munich, to work under Rahl. In order to perfect himself in coloring, he proceeded to Antwerp in 1850, and thence to Paris. Under the guidance of Couture, he acquired that minute finish of form and broad coloristic treatment which are characteristic of his works. The first of these was "Hafiz at the Inn" (1852). Leaving Paris in 1853, he painted at Karlsruhe the "Death of Pietro Aretino" (1854), and in 1855 went to Italy, with a stipend from the Government; working first in Venice, where he made a masterly copy of Titian's "Assumption," and painted a "Colossal Figure of Poetry" (1856), now in the Karlsruhe Gallery. From 1856 to 1872 he was in Rome, where, absorbed in the enthusiastic study of the great Italian masters, he developed his individual style. The first fruit of this tendency was his "Dante with the Noble Women of Ravenna" (1858). In Rome Feuerbach found a munificent patron in Baron von Schack, who acquired a number of his canvases for his famous collection in Munich, foremost among them the impressive "Pietà" (1863), besides "Francesca da Rimini and Paolo" (1864), "Ariosto with the Ladies at Ferrara," "Hafiz at the Fountain" (1866), "Laura and Petrarch at Avignon," "Idyl from Tivoli." From his sojourn in Rome also dates the charming "Madonna Surrounded by Angels Making Music" (1860), in the Dresden Gallery. More and more he confined his choice of subjects to the antique world, striving to give expression to his ideal—the cult of beauty—in serious and lofty themes, blending the classical traditions of the Italian Renaissance with the romantic spirit, imbued with a noble sentiment distinctly his own. Thus originated "The Banquet of Plato" (1867), in the Karlsruhe Gallery, a second conception of which, on a larger scale (1873), is in the National Gallery in Berlin; "Medea Preparing for Flight" (1870), in the New Pinakothek at Munich; "The Judgment of Paris" (1870), in the Hamburg Gallery, one of his most forceful compositions; and "Iphigenia in Tauris" (1871), his crowning effort. In 1873 Feuerbach was appointed professor at the Vienna Academy, but resigned in 1877, and retired to Venice, where he died. His last work was the exquisite though unfinished "Concert of Venetian Girls" (1878), in the National Gallery in Berlin. Consult: *Ein Vermächtnis von Anselm Feuerbach* (Vienna, 3d ed. 1890), containing autobiographical notes; Pecht, in *Zeitschrift für bildende Kunst,* viii. (Leipzig, 1873); and Allgeyer, *Anselm Feuerbach. Sein Leben und seine Kunst* (Bamberg, 1894).

FEUERBACH, LUDWIG ANDREAS (1804-72). A German philosopher, fourth son of Paul Johann Anselm Feuerbach. He was born at Landshut. After studying theology for two years at Heidelberg under Paulus and Daub, in 1824 he was attracted to Berlin for the purpose of hearing Hegel, and soon afterwards he abandoned theology to devote himself entirely to philosophy. In 1828 he became privat-docent in the University of Erlangen, but in a few years quitted the academical chair, and gave up his whole time to literary labor, residing at Bruckberg near Bayreuth till 1860, when he settled near Nuremberg. In a small anonymous work (*Gedanken über Tod und Unsterblichkeit,* 1830), he indicated that he had already gone beyond the standpoint of his master, Hegel, by combating the doctrine of immortality. During the next few years he published three works on portions of the history of philosophy, treating severely the periods from Bacon to Spinoza, of Leibnitz, and of Bayle. But these historical works only paved the way to a critical investigation into the nature of religion and its relation to philosophy. The most celebrated result of this is his work on the nature of Christianity (*Das Wesen des Christentums,* 1841), which was translated into English by George Eliot, under the title *The Essence of*

Christianity. Starting from the Hegelian doctrine that the absolute comes to consciousness in humanity, Feuerbach denies to God any existence except as an idealized object of human consciousness. The conception of God is thus merely the projection by man of his own ideal into the objective world. All authority above man is regarded as a delusion proceeding from man himself, and the highest good is explained as that which is on the whole most pleasurable. Yet even this highest good is further explained as consisting in resemblance to that ideal humanity which man creates for himself, and worships as God. In a later work he says that man is only what he eats (*Der Mensch ist nur was er isst*). This is not meant as an utterance of materialism, for according to Feuerbach materialism is a theory that resolves reality into the nature of extended substance, and thus fails to do justice to the sensuous features that experience reveals. Sensationalism is the proper term to apply to Feuerbach's philosophy, and yet it is a refined sensationalism, recognizing, whether consistently or inconsistently, the moral values. Although the impulse toward pleasure is the basis of all morality, the pleasure of others must be considered as of equal importance with one's own pleasure. (See UTILITARIANISM.) The works of Feuerbach have been collected and published in ten volumes (Leipzig, 1846-66). He died September 13, 1872. For his life, consult: Grün (Leipzig, 1874); Beyer (Leipzig, 1873); and Starcke (Stuttgart, 1885).

FEUERBACH, PAUL JOHANN ANSELM, von (1775-1833). One of the most distinguished jurists of Germany. He was born at Jena, November 14, 1775. Brought up at Frankfort-on-the-Main, where his father was an advocate, and educated in the gymnasium there, he went in 1792 to Jena, where he studied law and philosophy. In 1798 he appeared as a criminal jurist in a work entitled *Philosophisch-juristische Untersuchung über das Verbrechen des Hochverrats,* and in the following year he began to deliver lectures in the University of Jena. In his lectures and published writings he introduced into criminal jurisprudence a new method of treatment, which was systematized in his compendium of German penal law (*Lehrbuch des gemeinen in Deutschland geltenden peinlichen Privatrechts*, Giessen, 1801; 14th edition by Mittermaier, 1874). This celebrated work placed Feuerbach at the head of a new school of jurists, who maintain that the decision of the judge in every case ought to be determined solely by an express deliverance of the penal law, never by his own discretion, and who on that account obtained the name of 'rigorists.' In 1801 Feuerbach was appointed full professor in Jena, but in 1802 accepted a call to Kiel. In 1840 he removed to the University of Landshut; but the next year, having received a commission to prepare a penal code for Bavaria, he was transferred to Munich, and in 1808 he was appointed privy councilor. The new penal code which he planned for Bavaria (*Strafgesetzbuch für das Königreich Baiern*, München, 1813) received the royal approval, and was taken as a basis for the emendation of the criminal law of several other countries. During this period also he published his "Remarkable Cases in Criminal Law" (*Merkwürdige Criminalrechtsfälle*, 2 vols., Giessen, 1808-11), which first led the way to a deeper psychological treatment of such cases. In 1812 he published a work on trial by jury, to which a second volume, on the judicial procedure of France, was added in 1825 as the result of a visit to Paris in 1821. In 1814 he became second president of the Court of Appeals in Bamberg, and in 1817 first president of the Court of Appeals at Anspach. In 1832 he published a work on Kaspar Hauser, whose mysterious fate had strongly attracted his interest. He had just edited a collection of his miscellaneous writings, when he died at Frankfort-on-the-Main, May 25, 1833. An interesting life of Feuerbach was written by his son Ludwig (*Leben und Wirken Anselm von Feuerbachs,* 2 vols., Leipzig, 1852).

FEUERKRÖTE, foi′ẽr-krē′te (Ger., fire-toad). A common and curious frog (*Bombinator igneus*) of Europe, called 'fire-bellied' because of the vivid flame-color, marbled with black, of its under parts. The abdominal surface is smooth, but the upper surface, which is olive-green, is extremely warty and toad-like. Two varieties (or perhaps species) are recognized, the orange-bellied of the lowland marshes and the yellow-bellied of mountainous regions. It extends eastward into temperate Asia, but is not known in Great Britain. It is essentially aquatic. The female utters a high-pitched cry, and is exceedingly shy; the tadpoles grow to an unusually large size, especially in respect to their tail-fin. These frogs are interesting as representatives of the peculiar family Discoglossidæ (q.v.), and also for the remarkable way in which, when they think themselves in danger, they assume an erect, stiffened attitude intended to display the bright 'warning colors' of their bellies. This is correlated with the fact that their skins yield an exceedingly poisonous secretion, so that no known bird or mammal eats them. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

FEUILLANTS, fẽ′yäɴ′. The name applied to (1) a religious congregation, springing out of the Cistercian Order and taking its name from the mother house of Feuillant, Latin *Fulium,* near Toulouse. Its founder was Jean de la Barrière, who was abbot of this monastery from 1562. Protestantism made inroads upon his community, and the ancient discipline was relaxed. Finally, after courageous efforts at enforcement of the rule, he was deserted by most of his monks and himself accused as an innovator before the General Chapter at Cîteaux. He defended himself so successfully that a number of the old monks put themselves under his guidance, and he instituted a severer mode of life than had of late been customary in Cistercian houses. They came to Paris in 1587, protected against the Huguenots by a troop of cuirassiers, to take possession of the convent founded for them by Henry III. The reform was confirmed as a separate congregation by Sixtus V. in 1589. In 1630 Urban VIII. divided them into two branches, the Italian, known as Reformed Bernardines, and the French, who still kept the name of Feuillants, each under a general of its own. Cardinal Bona and other famous theologians have belonged to this Order. Barrière also founded a community of women, and Cardinal Rustico did the same at Rome, placing his under the direction of the Feuillant fathers.

Anne of Austria founded a house for them in Paris in 1662.

(2) A faction in the assembly of the clergy in Paris (1755), which discussed the execution of the constitution *Unigenitus.* At this time Cardinal de la Rochefoucauld, Archbishop of Bourges, was appointed Minister of Public Worship (*de la Feuille*, hence the name), and took the lead of a sort of ministerial party, Gallican and half Jansenist in tone, which formed a small majority of the assembly. See Gallican Church.

(3) A political club in Paris during the early years of the French Revolution, originally known as the Society of the Friends of the Constitution, or the Club of 1789. It met at the ancient convent of the Jacobins, and comprised a majority of the members of the Constituent Assembly. With the progress of radical ideas, the friends of monarchy in the society grew discontented, and in July, 1791, more than three hundred deputies, among them Barère, Lanjuinais, Sieyès, Lafayette, and the Lameths, seceded, taking up their home in the convent of the Feuillants in Rue Honoré (see above). Those who remained came to be known specifically as Jacobins (q.v.). The Feuillants lost rapidly in numbers and influence; as a group of well-fed men who believed in a constitutional monarchy, they were hated alike by Jacobins and Royalists. In the Legislative Assembly they numbered only 162 out of a total of 745, and from conservative they became, in the course of time, reactionary. The Jacobins repeatedly impeached them before the Assembly; in December, 1791, they were compelled to abandon their meeting-place in the Feuillants, and in August, 1792, the papers of the club were seized. It died peacefully.

FEUILLET, fẽ'yâ', Octave (1821-90). A popular French novelist and dramatist, born at Saint Lô. A favorite of the Court and society of the Second Empire, he was of Norman birth. He began his literary life as a collaborator of the elder Dumas, but presently deserted the romantic group and set up as a 'family Musset,' a purveyor of novels and plays that should seem proper for general reading. His early dramas, *Le cheveu blanc* (1856); *Le roman d'un jeune homme pauvre* (dramatized from his story of the same name, in 1858); *La tentation; La belle aux bois dormant; Montjoye,* are fundamentally unhealthy growths of hothouse sentiment. His dramatic works (*Théâtre Complet*) were collected in five volumes (1892-93). No one has painted so well the high-strung, neuropathic society woman, and in this he contributed an essential element to the growth of realism in fiction. On the fall of the Empire he grew more sternly realistic in his treatment of the hard, selfish cynicism of the French upper class. It is curious to contrast in this regard *Monsieur de Camors* of 1867 with *Julia de Trécœur* of 1872, and this again with the *Histoire d'une parisienne* (1881) and *Les amours de Philippe* (1887).

FEUILLETON, fẽ'ye-tôɴ' (Fr., leaflet). A name given first to the literary portion of a French journal, usually occupying the lower third of the first page, 'below the line' as it is technically called. The idea originated with the elder Bertin, editor of *Le Journal des Débats* (1800-41). The space was originally occupied, as it is often still, by criticisms, essays, and tales; but in the early thirties, first perhaps by Eugène Sue, the feuilleton began to be used for continued stories, often of portentous length; and the innovation became so popular as to have a noticeable effect on the minor and even the greater novelists. Each day demanded its copy, hasty production became the rule, unity of construction was sacrificed to the independent interest of each fragment, the attention of the reader was directed to details, and the whole suffered from the accentuation of its parts. This will account for the literary defects in such still popular novels as Dumas's *Monte Cristo* (Paris, 1845); Sue's *Le juif errant* (Paris, 1845); and *Les mystères de Paris* (Paris, 1843). The greatest purveyors of feuilleton were the elder Dumas, Sue, Soulié, Souvestre, Karr, Bernard, Paul de Kock, and Janin. Their most popular successor was Ponson du Terrail.

FÉVAL, fâ'vål', Paul Henri Coretin (1817-87). A prolific novelist, best remembered for his sensational *Mystères de Londres* (11 vols., 1844), which rivaled for a time Sue's *Mystères de Paris*, and was dramatized and several times translated. Among other novels dramatized with success, the more noteworthy are: *Le fils du diable* (1847); *Le bossu* (1858); *Le dernier vivant* (1873); *Les merveilles du mont Saint-Michel* (1879). There are translations of other novels with the titles, *The Lover of Paris* (1846); *The Duke's Motto* (1863); *The Woman of Mystery* (1864); and *Thrice Dead* (1869).

FEVER (AS. *fefer*, OHG. *fiebar*, Ger. *Fieber*, from Lat. *febris*, fever, from *fevere*, to be hot). A condition occurring during disease characterized principally by increase of the temperature of the body. The temperature is estimated according to the state of the internal parts, rather than the external. The term fever is also applied to certain diseases in which high temperature is a prominent symptom, as typhoid fever, scarlet fever, yellow fever. Fever is a constant accompaniment of these diseases, as well as of pneumonia, which was formerly called lung fever. In most such diseases there is first a feeling of weakness, apathy, loss of appetite, and a chilly feeling, with pains in the body and limbs, and rapid pulse, constituting the period of *invasion.* Succeeding this comes the period of *domination*, during which the pulse remains rapid, the surface becomes flushed and hot, the temperature rises still higher; thirst, headache, restlessness, and rapid breathing exist; the skin is very dry, and the urine is scanty. During the *decline* of the fever the temperature falls, perspiration breaks out, the rate of respiration diminishes, pains cease, and the patient falls asleep. All fever is dependent upon a morbid process which causes deterioration of the blood or other tissue, and is due partly to chemical changes which occur, and partly to irritation of the nervous system by some substance produced by the disease. There are no 'self-originating,' or 'spontaneous' or 'idiopathic' fevers. Fevers are named according to prominent features, supposed or real causes, or localities in which they are commonly found. Thus we have scarlet and yellow fevers, malarial fever, ship (or jail) fever, Malta fever, spotted fever, dengue (or dandy) fever, etc. If a fever is protracted for several days during which the temperature remains above the normal (98.4° F.), the type is called *continued;* if the temperature drops to the normal and rises again, after intermissions of a few hours, a day, or two days, the fever is called *intermittent;* if the temperature falls to a point above the normal and ascends again, oscillating in this way for several days, the fever is styled *remittent.* A certain fever decreases after several days till the temperature reaches the normal, and then after an interval of a few days it returns. This is styled *relapsing* fever. An intermittent fever in which the intermission is one day, or two days, or three days, is respectively termed a quotidian, tertian, or quartan type. A rise of temperature due to fatigue, teething, or to vaccination, or a local heat due to an infected sore or a boil, is not called a fever, though probably with a larger knowledge of the pathological conditions of tissue during fever the name might be applied even to these cases.

In treating cases of fever, it is customary to record at certain intervals each day the degree of temperature reached by the clinical thermometer, placed in the mouth of the patient. This record of temperature is plotted on a special chart, with lines connecting the points reached by the temperature, and the resulting diagram is called the 'fever cure.' For convenience' sake the rate of pulse and of respiration, morning and evening, is recorded on the chart, as well as the defecation and urination in certain cases. For simple continued fever, or abortive fever, see FEBRICULA; for ardent fever, see HEAT STROKE; for autumnal fever, see TYPHOID FEVER; for ship fever, jail fever, or camp fever, see TYPHUS FEVER; for spotted fever, see MENINGITIS (paragraph *Cerebro-Spinal Meningitis*); for bilious fever (an improper term), see MALARIA and TYPHOID FEVER. Many other febrile disorders are described under their own names.

FEVER-BUSH (so called as being sometimes used for intermittent fevers), *Lindera Benzoin,* or *Benzoin odoriferum.* A shrub common in the Northern United States, remarkable for its graceful form and beautiful leaves. It is from 4 to 15 feet high, and grows best in moist and shady places. The bark is aromatic and tonic, and a decoction is used as a stimulant in fevers. The berries, which are bright scarlet in autumn, have occasionally been used as a substitute for allspice, and sometimes the shrub is called spicebush and wild allspice.

FEVERFEW (AS. *feferfuge,* from Lat. *febrifugia* century plant, from *febris,* fever + *fugare,* to put to flight, from *fugere,* to flee), *Chrysanthemum Parthenium.* A perennial plant, found in waste places and near hedges in America and many parts of Europe. It is botanically allied to chamomile, and still more nearly to wild chamomile (*Matricaria Chamomilla*), and much resembles these plants in its properties, but differs in appearance, the segments of its leaves being flat and comparatively broad, and its flowers smaller. Its habit of growth is erect, its stem much branched, and about one to two feet high. It has a strong, somewhat aromatic smell. It was once a popular remedy in ague, and from time immemorial has been used as an emmenagogue. It is employed in infusion, and is stimulant and tonic. A double variety is not uncommon in gardens. A related genus is the mayweed or dog-fennel (*Matricaria inodora*), with leaves more resembling those of chamomile, but almost scentless, and large flowers, with white rays and yellow disk, very common in grain-fields and waste places in America and throughout Europe. A form without the white rays is not uncommon.

FEVER-TREE. See PINCKNEYA.

FEVERWORT (*fever* + *wort,* root, AS. *wyrt,* OHG. *wurz,* Ger. *Wurz;* connected with Lat. *radix,* root), HORSE GENTIAN, or WILD COFFEE, *Triosteum perfoliatum.* A perennial plant of the natural order Caprifoliaceæ. It has an erect, round, hairy, fistular stem, from one to four feet high, opposite ovate lanceolate entire leaves, and axillary whorls of brownish-purple flowers. It is a native of North America, occurring in rich woods from Canada to Alabama, and west to Iowa. Its dried and roasted berries have been occasionally used as a substitute for coffee; but it is chiefly valued for its medicinal properties, its root acting as an emetic and mild cathartic. It is sometimes called *Tinker's root,* being named after Dr. Tinker, who first brought it into notice.

FEWKES, fūks, JESSE WALTER (1850—). An American ethnologist, born at Newton, Mass. He graduated at Harvard in 1875, took his degree of Ph.D. there in 1877, and pursued the study of zoölogy at Leipzig (1878-80). He was an assistant at the Museum of Comparative Zoölogy of Harvard from 1881 to 1889, secretary of the Boston Society of Natural History from 1889 to 1891, and editor of the *Journal of Ethnology and Archæology* from 1890 to 1894. He was director of the Smithsonian Archæological Expedition to Arizona, and in 1895 became an ethnologist of the Bureau of American Ethnology. His writings comprise pamphlets on marine zoölogy and American archæology and ethnology, including a report on the ceremonies of the Moqui Indians.

FEYDEAU, fâ'dô′, ERNEST AIMÉ (1821-73). A French sensational novelist, a mediocre dramatist, and an antiquarian scholar of some distinction, born in Paris. He published a volume of commonplace verse in 1844, and in 1858 sprang into notoriety with *Fanny,* a daringly realistic study of the psychology of jealousy, to be associated with Constant's *Adolphe.* His later novels and his plays are wholly negligible. He wrote also an unfinished *Histoire des usages funèbres et des sépultures des peuples anciens* (1857-61); *Le secret du bonheur* (1864, trans. 1867); sketches of Algerian life; and *L'Allemagne en 1871* (1872), a clever but bitter view of Germany.

FEYEN, fe-yäN′, EUGÈNE (1815—). A French genre painter, born at Bey-sur-la-Seille (Meurthe). He was a pupil of Paul Delaroche, and began as a painter of portraits and nudes. It was not until 1869 that he exhibited his first study of fisher-folk, in which genre he is most successful. His composition is clever and his color agreeable. Among his best works are: "The Harvesters of the Sea" (1872), in the Luxembourg; "The Bay of Cancale" (1885); and "The Sailor's Sweetheart" (1890). He received a second-class medal in 1880, a third-class medal at the Paris Exposition of 1889, and the Cross of the Legion of Honor in 1881.

FEYEN-PERRIN, pe-răɴ′, François Nicolas Augustin (1826-88). A French genre painter, the brother of Eugène Feyen, born at Bey-sur-la-Seille (Meurthe). He studied under Yvon and Cogniet at the Ecole des Beaux-Arts. In 1864 he exhibited his first successful picture, "The Beach." A series of Breton studies show him at his best. He is a better draughtsman and colorist than his brother, and has rendered the atmosphere of the sea with fine effect. His pictures include "Return of the Oyster Fishers" (1874; Luxembourg); "The Winnower" (1867); "Return from Fishing at Low Tide," and, in another manner, "The Death of Orpheus" (1878), and the portrait of Alphonse Daudet. He received medals at the Salons of 1865 and 1874, and the Legion of Honor in 1881.

FEYJÓO Y MONTENEGRO, fā′ê-ʜō′ô ê môn′tâ-nā′grô, Benito Gerónimo (1676-1764). A Spanish critic and scholar, born at Cardamiro, near Orense. He entered the Benedictine Order, and lived all his life at one of the monasteries of the Order at Oviedo, where he died. He studied not only religion, but mathematics, philosophy, and medicine, and was almost the first to appreciate how far Spain was behind other European countries in these matters. Feyjóo's works included the *Teatro crítico universal para desengaño de errores comunes* (1726-60), which appeared in eight volumes. The *Teatro* has been compared to Addison's *Spectator*, but it is of a weightier quality. Feyjóo wrote about the position of women; the manners of the clergy; the scientific discoveries of Galileo, Bacon, Pascal, and Newton; popular fallacies concerning comets and eclipses; and other matters. In 1739 he ceased to publish the *Crítico*. In 1742 he began *Cartas eruditas y curiosas* (1742-60), which continued the leavening process begun by the other. His complete works were published in Madrid (1780).

FEZ. One of the capitals of Morocco, situated about 130 miles south of the Strait of Gibraltar in a valley surrounded by high hills (Map: Africa, D 1). The city lies on both banks of a tributary of the Sebu, which divides it into the two parts of Fez el-Bali, the old town, and Fez el-Jedid. It is a very ill-built town, with narrow, filthy streets, with no sanitary arrangements, which, together with a humid climate and an inadequate water-supply, make it most unhealthful. In its flourishing days Fez had about 90,000 dwelling-houses and 800 mosques. Of the latter only about 130 are left. Of these the most important are Muley-Edris, containing the tomb of Edris II. (the reputed founder of Fez), and Jama-Karubin, to which is attached one of the highest educational institutions of the Mohammedan world, and which contains a large library of Arabian works on theology. Fez has also a number of minor schools, and is still regarded as an important educational centre. The industries are considerable, the products including leather, rugs, shawls of silk, and the red 'Fez' caps. In point of commerce Fez is the most important city of northwestern Africa. It is the distributing centre for European products from Marseilles and London, while its caravans travel as far as Timbuktu. The population of Fez, formerly about 400,000, is now estimated at 140,000, consisting chiefly of Moors, and with some Arabs, Berbers, and about 10,000 Jews. The foundation of Fez is usually believed to have taken place at the end of the eighth century (793), and is attributed to Edris II. The city was held in high veneration by the Mohammedans, and attracted numerous pilgrims. In the thirteenth century it became the capital of an independent State, when it prospered greatly. In the middle of the sixteenth century it passed to Morocco, and since then it has gradually declined.

FEZ. A red brimless cap of fine wool, fitting closely to the head, with a tassel of black or blue, worn in Turkey, Persia, Greece, Albania, Egypt, and on the shores of the Levant generally, and designating a Turkish subject, even if not a Mussulman. The name was derived from the town of Fez, in Morocco, where such caps were first made. In Africa it is also called *tarbûsh*.

FEZZAN, fĕz-zän′. A lieutenant-governorship of the Turkish Vilayet of Tripoli, in northern Africa (Map: Africa, F 2). It is an extensive oasis occupying the southern portion of the vilayet, with a total area of about 150,000 square miles. The greater portion of the surface consists of hills of black quartz sandstone, among which the most prominent are the Jebel-es-Soda or Black Mountains, running from east to west for a distance of about 170 miles, and not exceeding 3000 feet in altitude. The northwestern part of the country is an elevated waterless plateau known as Hammada-el-Homra, while the southern portion is a desert. The rivers are insignificant, and vegetation is found mainly along the wadies, or dried-up river-courses, where also are located the chief centres of population. The chief of these wadies are the Shati, lying between latitudes 27° and 28° N., and the Sherki, situated south of the Shati, the centre of the most fertile section of Fezzan. The climate is hot and dry in the summer, and cold in the winter. Not more than a tenth of the area is cultivable. In the neighborhood of the villages, which are situated mainly in the wadies, wheat, barley, etc., are grown partly with the aid of artificial irrigation. The date is the principal article of food. Large numbers of camels and horses are raised. The population is estimated at a little over 40,000. The inhabitants are a mixed race, of a brown color, generally well formed, and in many respects resembling the negro. The original inhabitants belonged to the Berber family, but since the invasion of the country by the Arabs the traces of this native North African element have gradually disappeared. The chief elements in the population are Tuaregs, Arabs, Moors, and negroes. The language spoken is a corrupt mixture of Berber and Arabic. The capital is Murzuk (q.v.). Fezzan is the Phazania of the ancients, and was conquered in B.C. 19 by the Romans under the proconsul L. Cornelius Balbus. Christianity was introduced at the end of the sixth century, but with the conquest of the territory by the Arabs at the end of the seventh century Mohammedanism took its place. The territory was governed by its own princes under the suzerainty of the Arabs, and subsequently became a tributary State of Tripoli. With the extinction of its dynasty of rulers, Fezzan became, after a period of internal uprisings and usurpations, a dependency of Tripoli.

FIACRE, fyȧ′kr′, or **FIACHRACH**, Saint (?-c.670). A monk of France in the seventh century. He was born of noble parents in Ireland. He became an anchorite, and then left his native country with some companions for France. They were kindly received by Faro, Bishop of Meaux. The Bishop gave him a residence in the forest of Breuil, in Brie, the region south of Meaux, where Fiacre built a cell, and gave asylum to such strangers as fell in his way. According to the Irish custom, no woman was allowed to enter the monastery. After his death, about 670, his shrine had the reputation of working miracles, and pilgrimages to it began. The day of his death was August 18th, but his festival is kept August 30th. Saint Fiacre is the patron saint of gardeners. The proprietor of the Hôtel de Saint-Fiacre, in the Rue Saint-Martin, Paris, opened the first livery stable in Paris in 1640. A statue of the saint stood over the door, and this circumstance gave the name *fiacre* to a public carriage in France.

FIAMMETTA, fē′ȧ-mĕt′tȧ. The name given by Boccaccio in his works to his lady-love, believed to be Maria, daughter of Robert, King of Naples.

FIAS′CO. A term borrowed from the Italian theatre, signifying a failure to please on the part of an actor or singer, although why the word, which simply means a flask, should come to be thus applied, is not altogether clear.

FI′AT (Lat., let it be). In English legal procedure, an indorsement of a judge, master, or registrar upon an application for an order or rule, which serves in lieu of a formal order. It is in the nature of a brief memorandum. The purposes for which it may be employed are strictly limited, and it is chargeable with a smaller fee than an order which is drawn up in due form. The term is also applied to the formal leave of the Attorney-General to take certain proceedings, indorsed upon an application. It was formerly also applied to an order that a commission in bankruptcy issue; but its use in that connection has been abolished by statute.

FIAT MONEY. Inconvertible paper money, not even containing a promise to pay, but issued by the State with the bare assertion of its identity with true money, although no provision is made for its exchange for specie. Fiat money was issued by the American colonies to a considerable extent, and the history of its rapid depreciation and final worthlessness is well known. When a government is forced to this measure, the state of its finances is virtually bankruptcy. The name 'fiat money' was first given to irredeemable paper currency during the so-called Greenback agitation in the United States after the Civil War, from the claim of the Greenback Party that the *fiat* of the Government could itself give value to a circulating medium.

FIBIGER, fē′bĭ-gẽr, JOHANNES HENRIK TAUBER (1821—). A Danish divine and poet, born at Nykjöbing, on the island of Falster. His poetic works include: *Johannes den Döber*, a biblical drama (1857); *Kors og Kjærlighed*, a tragedy of domestic life (1858); *Nogle Sagn*, stories-in-verse (1865); *Den evige Strid*, a tragedy (1878; very popular); *Graabröderen*, a narrative in 16 cantos (1882); and a collection of poems (1884).

FIBONACCI, fē′bō-nä′chē̇, LEONARDO, called LEONARDO PISANO. One of the greatest mathematicians of the Middle Ages. He flourished at the opening of the thirteenth century, but little is known of his personal life. He early acquired a love for mathematics and science, and perfected his knowledge on his journeys to Egypt, Syria, Greece, and Sicily, where he seems to have sought the company of the learned men of his time. Returning from his travels, he devoted his time to writing, and the following works testify to his great learning: (1) *Liber Abaci*, composed in 1202, of which only a second edition is extant; (2) *Practica Geometriæ;* (3) *Liber Quadratorum;* (4) *Flos*, treating of the cubic equation; (5) a letter to Theodorus, philosopher to the Emperor, relating to indeterminate analysis and to geometry. Fibonacci's name attaches to a certain series, important in the theory of numbers, viz., 0, 1, 1, 2, 3, 5, 8, 13 . . . , in which $u_{n+2} = u_{n+1} + u_n$. This series has many interesting properties; e.g. (1) the sum of the first $n + 1$ terms, $u_0, u_1, u_2, \dots u_n$, increased by 1, equals u_{n+2}; (2) the square of any term is one unit less than the product of the two adjacent to it. The works of Fibonacci were published by Prince Boncompagni (2 vols., Rome, 1857-62). Consult Lucas, *Recherches sur plusieurs ouvrages de Léonard de Pise et sur diverses questions d'arithmétique supérieure* (Rome, 1877).

FIBRE (Lat. *fibra*, filament). A term of very common use as applied to objects of a stringy or thread-like character, whether of the animal, vegetable, or mineral kingdom. Minerals are often described as of a fibrous structure or appearance, in which there is, however, no possibility of detaching the apparent fibres from the general mass, or in which they are inflexible, and brittle if detached; but a more perfect example of mineral fibre is found in amiantus, a variety of asbestos. For the scientific use of the term fibre with regard to the animal kingdom, see the article MUSCLE; for its scientific use with regard to the vegetable kingdom, see VEGETABLE TISSUE; WOOD AND WOODY FIBRE. In its more popular but perfectly accurate use, it includes the hair or wool of quadrupeds, the silken threads of the cocoons of silkworms and other insects, the fibres of the leaves and of the inner bark of plants, and the elongated cells or hairs connected with the seeds of plants, the ordinary materials of cordage, and of textile fabrics.

Of mineral substances, amiantus alone has been used for textile fabrics, and that only to a very limited extent. Animal and vegetable fibres have, from the earliest ages, supplied man with cordage, and with cloth. How the invention took place can only be matter of conjecture. It is noted as an interesting fact that the most valuable commercial fibres of to-day were the prominent fibres of ancient times. Cotton, flax, hemp, as well as the common animal fibres, as hair, wool, and silk, were known and used in past ages.

The animal fibres used for textile purposes are chiefly of the two classes already mentioned—(1) the wool or hair of quadrupeds, and (2) the silk of the cocoons of insects. To these may be added (3) the byssus of mollusks, but this class contains only the byssus of the pinna (q.v.) of the Mediterranean, an article of ancient and high reputation, but more of curiosity than of use. The skins and intestines of animals, although sometimes twisted or plaited for various uses, can scarcely be reckoned among the fibrous materials afforded by the animal kingdom. For information regarding the fibres obtained from the cocoons of insects, see SILK AND SILKWORM. It is to the first class that the greater number of different kinds of animal fibres used for textile purposes belong; and the wool of the sheep far exceeds all the rest in importance. But the wool or hair of other quadrupeds is also to some extent used, as that of the goat, the alpaca, the camel, the musk-ox, and the yak, all of which are, like the sheep, ruminants. The hair of comparatively few animals is sufficiently long for textile purposes, or can be procured in sufficient abundance to make it of economic importance. The warmth of clothing depends much on the fineness of the hair, and on other characters in which wool particularly excels. See SHEEP; WOOL; GOAT; ANGORA; ALPACA; CAMEL; MUSK-OX; YAK.

The useful vegetable fibres are far more numerous and various than are the animal. They are obtained from plants of natural orders very different from each other. They are obtained also from different parts of plants. Wood-cells are found in the bark, and are longer, finer, and tougher than those found in the wood. They form the principal part of the fibrous bark or bast layer of cells. These give toughness and flexibility to the structure, and the extracted bundles of cells form the filamentous product, known as flax, hemp, and jute, derived from dicotyledonous plants. In monocotyledons the fibrous cells are built up with others into a composite structure known as fibro-vascular bundles. Such fibre occurs in the palms, and in the fleshy-leaved agaves, the bundles being found not as in bark, but throughout the stem or leaf forming the supporting structure. These filaments, when separated from the soft cell-mass by which they are surrounded, may be known as structural fibre, of which the fibre of sisal hemp is an example. The simple cells produced on the surfaces of the seeds of endogens constitute a fibrous material, to which the name surface fibre has been given. Such hairs as the cotton of commerce and the cocoanut are examples.

The fibre bundles, therefore, whether occurring as bast fibre or structural fibre, or whether in the form of simple cells, as surface fibre, may be regarded as the spinning units; aggregations of bundles purified and cleansed of all extraneous matter, and simply twisted together. The netting structure of the plant, by which means the filament is separated. The fibres of the leaves of endogens, being parallel to each other, are easily obtained of sufficient length for economical purposes; while the reticulated fibres of leaves of exogens, even if long enough, which is comparatively seldom the case, cannot be separated for use. The bast fibres of exogens, however, are often of sufficient length, and easily separable. The separation is generally accomplished by steeping in water, or by frequent dampening with water so as to cause a partial rotting of the other parts of the bast, and of the bark which covers it. Since the fibres of endogens are in general discolored and injured by this damp process to a much greater degree than are those of exogens, mere mechanical means are usually preferred for their separation, such as beating, passing between rollers, and scraping. The fibres of many leaves are separated by scraping alone. The fibres of seeds, as cotton, exist in nature attached to the seed, like the wool or hair of animals, and require merely to be collected and cleaned.

There are two natural groups of fibres—the commercial species, and the vast group of the so-called native fibres. Among the uncivilized races many species of fibre-plants which civilized man cannot afford to employ commercially have become most useful for utensils, cords, and clothing. While 30 or 40 species of plants supply the world's demand for commercial fibres, hundreds of fibrous plants could readily be enumerated. The list of commercial fibres may be increased from time to time. Of those now important there are six bast fibres, as follows: Flax (*Linum usitatissimum*); China grass (*Bœhmeria nivea*); hemp (*Cannabis sativa*); jute (*Corchorus capsularis* and *Corchorus olitorius*); Sunn hemp (*Crotalaria juncea*); and Cuba bast (*Hibiscus tiliaceus*). There are two surface fibres: Cotton (*Gossypium* spp.) and raffia (*Raphia pedunculata*). The list of structural fibres numbers 15, representing agaves, palms, and grasses as follows: *Cordage fibres*—Sisal hemp (*Agave rigida* var.); Manila hemp (*Musa textilis*); Mauritius flax (*Furcrœa gigantea*); New Zealand flax (*Phormium tenax*). *Brush fibres*—Tampico or istle (*Agave heteracantha*); Bahia piassaba (*Attalea funifera*); Para piassaba (*Leopoldinia Piassaba*); Mexican whisk, or broom-root (*Epicampes macroura*); cabbage palmetto (*Sabal palmetto*). *Upholstering and matting fibres*—Crin végetal (*Chamærops humilis*); Spanish moss (*Tillandsia uscoides*); saw palmetto (*Serenoa serrulata*); cocoanut fibre (*Cocos nucifera*). *Paper manufacture*—Esparto grass (*Stipa tenacissima*), a substitute for bath sponges; and vegetable sponge (*Luffa Ægyptica*).

The sources of supply of these fibres are as follows: Flax is produced chiefly in Belgium, Russia, Holland, Italy, Great Britain, and Ireland, the United States and Canada; China grass or ramie comes from China; hemp is obtained from Russia, United States, France, Belgium, Germany, Austria-Hungary, Italy, and the Netherlands; jute from India and Cuba; bast from the West Indies; cotton is chiefly produced in the United States, Egypt, and Peru; raffia comes from Africa; sisal hemp is produced in Yucatan, Cuba, and the Bahamas; Manila hemp is a product of the Philippine Islands; Mauritius or aloe fibre comes from Africa; New Zealand flax from the country indicated by its name; Tampico or istle is a Mexican product; Bahia or Para piassabas, or 'bass' fibres, are collected from Brazilian palms, other species of bass from African palms; broom-root is a Mexican product; the two palmetto fibres are produced from species of Florida palms; crin végetal is derived from an allied palm, growing in Algeria; vegetable hair from Spanish moss is prepared in South Carolina and the Gulf States; cocoanut fibre comes from the East Indies; esparto grass is produced in Algeria, Spain, and Portugal; vegetable sponge largely in Japan. Other fibrous substances appear in the form of straw plait from Italy, Japan, and China chiefly. The Eastern floor mattings and basketry are made from various fibres.

The highest use for which fibre may be employed is in the manufacture of cloth or woven fabric. The next higher uses are in the manufacture of threads, twines, cords, and ropes known as cordage. A third use is in the manufacture of brushes and brooms, for which a different class of fibre than either the fabric or cordage fibres is employed. Fourth, fibres are used in the manufacture of many plaited or coarsely woven articles employed in domestic economy, some of which are of commercial importance, while the greater number are 'native' productions. A fifth form of utility is the employment of fibres or fibrous substances in mass as filling material, for stuffing pillows, cushions, mattresses, furniture, etc., or as packing substances. A sixth and exceedingly important use is in the manufacture of paper. For further information, consult: Watt, *Dictionary of Economic Products of India* (Calcutta, 1889); Morris, *Commercial Fibres* (London, 1895); "Vegetable Fibres," *Kew Royal Gardens* (London, 1898); Dodge, "Useful Fibre Plants of the World," *United States Department of Agriculture, Fibre Investigations, Report No. IX.* (Washington, 1897). See FLAX; JUTE; RAMIE.

FI′BRIN (from Lat. *fibra*, fibre). A proteid substance somewhat similar to myosin and globulin (see GLOBULINS), from which it may be readily distinguished by its insolubility in dilute acids and alkalies as well as in dilute solutions of common salt. By the action of pepsin or of trypsin, fibrin is converted into certain forms of globulin. Fibrin may be obtained from blood by beating or stirring with a bundle of twigs, to which the fibrin adheres in strings. The impure substance thus obtained is rinsed with water, and may be boiled with alcohol and ether, to remove fatty matters. The properties of fibrin depend to some extent on the manner in which this method of preparation is carried out, and Denis succeeded in obtaining three distinctly different forms of fibrin. Fibrin has the peculiar property of decomposing peroxide of hydrogen without itself undergoing any chemical change.

FIBRIN′OGEN. See GLOBULINS.

FIBRO′NIA. See TUMOR.

FI′BRO-SARCO′MA. See TUMOR.

FI′BROVAS′CULAR BUNDLE (*fibro-*, from Lat. *fibra*, fibre + *vascular*, from Lat. *vasculum*, little vessel, diminutive of *vas*, vessel). A strand of supporting and conducting tissue in ferns and seed-plants. A bundle usually comprises wood and bast (qq.v.), or may consist entirely of either one. The term 'fibrovascular' is given because there are usually some fibres associated with the vessels. See ANATOMY; FIBRE.

FIB′ULA. See LEG.

FIBULA PRÆ′NESTI′NA (Lat., Prænestine brooch). A gold brooch found in 1886 at Præneste. It bears a retrograde inscription in Old Italic characters, which is the oldest extant specimen of Latin, dating probably from the sixth century B.C., and which is important as showing the reduplicated perfect, the use of the dative ending *-oi* and the early use of the accusative ending *-d*. The inscription reads: MANIOS MED FHEFHAKED NUMASIOI, which is equivalent to classical Latin *Manius me fecit Numasio* (Manius made me for Numasius).

FICHEL, fė′shĕl′, EUGÈNE (1826-95). A French painter, born in Paris. He was a pupil of Paul Delaroche. His first work of importance was exhibited in 1850, "Harvey Demonstrating the Circulation of the Blood to Charles I." Fichel has the miniature style of Meissonier, great care in finish, archæological exactness, and a kind of delicate humor. Among his numerous works are: "A Morning Call" (1855); "The Arrival at the Inn" (1863), in the Luxembourg; "The Foundation of the French Academy" (1872); "The End of Dinner" (1872); and "The Council of War" (1890).

FICHET, fė′shâ′, GUILLAUME. A French scholar of the fifteenth century. In 1467 he was elected rector of the University of Paris, and he installed in the Sorbonne the first printing-press ever set up in France, with the aid of three printers who came from Mainz to assist him in this work. The first book printed was *Lettres de Gasparino* (1470). Some of Fichet's own books followed, such as *Ficheti Guilielmi Artium et Theologiæ Doctoris, Rhetoricorum Libri III.* (1470). Consult Phillipe, *Guillaume Fichet, sa vie et ses œuvres. Introduction de l'imprimerie à Paris* (Annecy, 1892).

FICHTE, fĭK′te, IMMANUEL HERMANN (1797-1879). A German philosopher, son of Johann Gottlieb Fichte. He early devoted himself to philosophical studies, being attracted by the later views of his father, which he considered essentially theistic. He also attended the lectures of Hegel, but felt averse to what he deemed to be his pantheistic tendencies. Occupied at first as a teacher, Fichte was appointed professor of philosophy in Bonn in 1836, and from 1842 to 1863 held a chair in the University of Tübingen. His chief works are: *Beiträge zur Charakteristik der neuern Philosophie* (1829; 2d ed. 1841); *System der Ethik* (1850-53); *Anthropologie* (1856). The great aim of his speculations was to find a philosophic basis for the personality of God, and for his theory on this subject he proposed the term *concrete theism*. The regeneration of Christianity, according to him, would consist in its becoming the vital and organizing power in the State, instead of being occupied solely, as heretofore, with the salvation of individuals.

FICHTE, JOHANN GOTTLIEB (1762-1814). An illustrious German philosopher. He was born the son of a ribbon-weaver, at Rammenau, in Upper Lusatia, May 19, 1762. As a lad of promise he attracted the attention of a neighboring nobleman, Baron von Miltitz, who assisted him in his early education. In 1776 Fichte was placed at the gymnasium of Pforta, near Naumburg, and in 1780 he entered the University of Jena, where, as subsequently at Leipzig, he studied theology and philosophy. During the years 1784 to 1788 he supported himself in a precarious way as tutor in various Saxon families. From 1788 to 1790 he taught in private families at Zurich, where he became acquainted with Pestalozzi. He then returned to Leipzig and in 1791 obtained a tutorship at Warsaw, in the house of a Polish nobleman. The situation, however, proved disagreeable, and the philosopher next proceeded to Königsberg, where he had an interview with Kant, of whom he had become an ardent disciple. He submitted his *Kritik aller Offenbarung* (Critique of all Revelation) to that philosopher, who praised it highly, and advised him to publish it. The following year it appeared anonymously, and was credited to Kant, who then made known its authorship. This incident established Fichte's fame as a philosopher. In 1794 he was appointed to the chair of philosophy at Jena, where he commenced to expound with extraordinary zeal his system of 'transcendental idealism.' In 1795 he published his *Wissenschaftslehre* (Doctrine of Science), in which he clearly broke away from Kant, whose speculations did not seem to him sufficiently thorough. In 1796 he published *Grundlage des Naturrechts* (Foundation of Natural Rights); in 1798, *System der Sittenlehre* (System of Ethics), and in the same year an article in a philosophical journal, which cost him dear. It was entitled "Ueber den Grund unsers Glaubens an eine göttliche Weltregierung" (The Basis of Our Belief in a Divine Government of the World). For views therein expressed he was charged with atheism, inasmuch as he had characterized God as the living moral order of the world. In vain did he deny the atheistic nature of this doctrine; the *odium theologicum* was too strong for him, and he was compelled to relinquish his chair. Fichte went to Berlin, where he delivered lectures to audiences composed of men of distinction, and where he made friends of such men as Schlegel, Schleiermacher, and Tieck. In 1805 he was appointed to a professorship in Erlangen. The approach of the French army drove him in 1806 to Königsberg, and in 1807-08 he delivered his famous "Addresses to the German Nation" ("Reden an die deutsche Nation") in Berlin. These addresses were full of the most exalted enthusiasm. The Prussian King appreciated the zeal of the eloquent metaphysician, and, on the restoration of peace, appointed him to a professorship in the newly founded University of Berlin. In 1810 the university was opened with a host of brilliant names—Fichte, Friedrich August Wolf, Wilhelm von Humboldt, DeWette, Schleiermacher, and Savigny. By the votes of his colleagues Fichte was unanimously elected rector. In 1813 the War of Liberation broke out, and the hospitals of the Prussian capital were soon crowded with patients. Fichte's wife was one of the first to offer her services as a nurse. For five months she tended the sick with all the patient tenderness and devotion of her nature. At last she was seized with typhoid fever, and after a fearful struggle she recovered; but her husband caught the infection, and died January 27, 1814.

The fundamental notion of the idealism set forth in Fichte's writings, at least in the earlier of them, is the sole reality of the conscious self or ego, which gives rise by its activity to the not-self or non-ego, inasmuch as self-knowledge is possible only in contrast with knowledge of a non-ego. The significance of this view in the history of philosophy can be understood only by comparing it with Kant's (q.v.), from which it was developed. Kant had taught that experience arose from the concurrent action of sensation and thought, sensation being the product of things in themselves as they affect the mind, while thought is the spontaneous activity of the conscious self. Thus, experience for Kant is dualistic. This dualism is what Fichte sought to overcome, and he set about it by denying that the sense element in experience is traceable to the action of objects independent of the percipient subject. The non-ego is the creation of the ego. This creation is not accomplished at the instigation of some external stimulus. It is an original, uncaused, free activity of the self. The first result of this activity is sensation. The act of giving rise spontaneously to sensation is an unconscious act; its effect is the first object of consciousness. Because the act is unconscious, its result seems to be obtruded upon consciousness from without, a well-known characteristic of sensation. Why does the self create a sense object? In order to give free play to its activity. It sets up an object as a limit only to transcend this limit. This is done in the successive stages of knowledge, beginning with perception and ending with the categorical imperative, which is the termination of the process, because at this point the self is conscious of *itself* (not of some apparently alien obtrusion), as *giving to itself* all its determinations. The ego, in so far as it is determined by the knowledge, is the intelligent ego, and, as such, the subject of theoretical science; the ego, on the other hand, as determining the non-ego, is the subject of practical science. To recapitulate, Fichte makes that which, from the standpoint of ordinary consciousness, we call the world, merely a product of the ego; it exists only through the ego, for the ego, and in the ego. The ego, however, is not held by Fichte to be the phenomenal self—that is, the limited temporal self which each person takes himself to be. On the contrary, the creative ego is a universal self common to all finite selves. Abstraction must be made from the finitude of our individual selves, for the finitude is itself a self-imposed limit to be transcended. The universal self thus reached is God. A popular exposition of his philosophy is given in his *Anweisung zum seligen Leben.* It is set forth in a strictly scientific manner in the lectures published in the *Nachgelassene Werke*, edited by I. G. Fichte (3 vols., Bonn, 1834-35), in which his *Speculative Logik* and his revised theory of law and morals are particularly deserving of attention. Although Fichte never, strictly speaking, formed a school, and although his system has been adopted only by a few, such as J. B. Schad, Mehmel, Cramer, Schmidt, and Michaelis, his influence upon the subsequent development of German philosophy has been very important, especially through the influence he exerted upon Hegel (q.v.). Fichte's collected works were published by his son, I. H. Fichte (1845-46). His popular works have been translated into English. Their titles are: *The Destination of Man; The Vocation of the Scholar; The Way to the Blessed Life; The Characteristics of the Present Age;* and *Outlines of the Doctrine of Knowledge.* A. E. Kroeger translated *The Science of Knowledge* (1889); *The Science of Rights* (1869 and 1889); and *The Science of Ethics as Based on the Science of Knowledge* (1897). Some of the shorter works have appeared in translations from time to time in the *Journal of Speculative Philosophy.* Consult: Kuno Fischer, *Geschichte der neuern Philosophie*, vol. v. (Heidelberg, 1897 et seq.); id., *Fichte's Leben, Werke und Lehre* (ib., 1900); Adamson, *Fichte* (London, 1881); Everett, *Fichte's Science of Knowledge: a Critical Exposition* (Chicago, 1884); Schneider, *Johann Gottlieb Fichte als Socialpolitiker* (Halle, 1894); Lindau, *Fichte und der neuere Socialismus* (Berlin, 1900); Weber, *Fichte's Socialismus und sein Verhältnis zur Marxschen Doktrin* (Tübingen, 1900); and the leading histories of philosophy, such as Erdmann's, Ueberweg-Heinze's, Windelband's, and Falckenberg's.

FICHTELGEBIRGE, fĭĸ'tel-ge-bēr'ge (Ger., Fir-mountains). A mountain range of Germany, situated in Upper Franconia, Bavaria (Map: Germany, D 3). It occupies a central position between the northwest-southeast ranges of the Thüringer Wald, Franken Wald, and Böhmer Wald, and the ranges of the Franconian Jura, Elstergebirge, and Erzgebirge, which have a northeast-southwest trend. The Fichtelgebirge is the eroded remnant of an old plateau, which at present has an extreme elevation of about 3400 feet, and occupies an area of 380 square miles. Schneeberg, the highest peak, is 3415 feet above the sea, while Ochsenkopf, Nusshardt, and Farnleite are more than 3000 feet. The main chain is bordered on the north and south by the small groups of the Waldstein and the Weissenstein. Geologically the Fichtelgebirge consists of granites, gneisses, and schists of Archæan and Paleozoic age. Rich deposits of copper, lead, and iron ores were the bases of an important metallurgical industry at one time, but they are now practically exhausted. In the more elevated portions the climate is raw and moist, and suited only to the cultivation of the hardier grains and to pasturage. Cut stone, lumber, and cotton and woolen manufactures are the principal products. The range forms the watershed between the Eger, the Main, and the Naab, and is thus drained by the great river systems of the Elbe, Rhine, and Danube.

FICINO, fė-chē′nȯ, Marsilio (1433-99). An Italian philosopher of the Renaissance. He was born in Florence, the son of the principal physician of Cosmo de' Medici, and to the liberality of this prince he owed the classical culture which inspired his future career. After some years of enthusiastic study, he appeared as a public teacher of Platonic philosophy, and was chosen by Cosmo to preside over his newly founded Platonic Academy. He translated into Latin Plato's own works and those of the Neo-Platonists Plotinus, Iamblichus, and Proclus, with commentaries. His most important original work was his *Theologia Platonica de Animorum Immortalitate*, in which he tried to give a rounded and systematic presentation of his beliefs. His whole life was devoted to the study and teaching of the Platonic philosophy, which he believed to be, while not perfectly Christian, yet the nearest to the Christian principles, and therefore calculated to win back to the latter minds which had been led astray by a false philosophy. His collected works, including his translations of Plato and Plotinus, were first published at Basel (2 vols., 1561-76).

FICK, Adolf Eugen (1829-1901). A German physiologist. He was born at Cassel, and was educated at Marburg and Berlin. He was lecturer and professor at Zurich from 1852 to 1868, and subsequently became professor at Würzburg. His publications include: *Die medizinische Physik* (3d ed. 1885), and *Kompendium der Physiologie* (4th ed. 1891).

FICK, August (1833—). An eminent German philologist. He was born at Petershagen, Westphalia, and studied under Benfey at Göttingen from 1852 to 1857, and then taught in the gymnasium there until his appointment in 1876 to an extraordinary professorship of comparative philology in the university. In 1888 he became professor at Breslau. His greatest work is the *Vergleichendes Wörterbuch der indogermanischen Sprachen* (4th ed. 1890—), a stupendous monument of learning, though its value is somewhat impaired by the audacity of its reconstruction of the primitive parent speech. Other works are: *Die griechischen Personennamen* (2d ed. 1894); *Die ehemalige Spracheinheit der Indogermanen Europas* (1875); and *Die homerische Ilias, in der ursprünglichen Sprachform wiederhergestellt*, vol. i. (1885).

FICK′ER, Adolf (1816-80). An Austrian statistician, born at Olmütz. He was educated at Vienna, and in 1873 was appointed president of the Central Bureau of Statistics, of which he had previously been secretary (1853-64) and director (1864-73). He also rendered important services as referee for realschulen and gymnasia in the Ministry of Education. His principal works are the following: *Die Bevölkerung der österreichischen Monarchie* (1860); *Die Bevölkerung Böhmens* (1864); *Völkerstämme der österreichisch-ungarischen Monarchie* (1869); *Geschichte, Organisation und Statistik des österreichischen Unterrichtswesens* (1871). He was also the founder of the *Statistische Monatsschrift* (1875), now published by the Imperial Bureau of Statistics, Vienna.

FICKER, Julius (1826-1902). A German jurist, born at Paderborn, and educated at Bonn, Münster, and Berlin. In 1852 he became professor of history and jurisprudence at Innsbruck. He became a member of the Vienna Academy of Sciences in 1866, and retired in 1879. His most important work is entitled *Forschungen zur Reichs- und Rechtsgeschichte Italiens* (1868-74).

FICORONI (fē′kȯ-rō′nė) **CIST**, The. The most celebrated of the ancient jewel-caskets found in Italy. It was discovered in 1745, by the Italian Ficoroni, and by him presented to the Museo Kircheriano at Rome. The casket is of cylindrical form, and bears representations of scenes from the story of the Argonauts, of the finest Greek workmanship, and an inscription giving the names of the owner and of the artist.

FICQUELMONT, fė′kĕl′môɴ′, Karl Ludwig, Count (1777-1857). An Austrian statesman and general. He was born at Dieuze, Lorraine, and entered the military service of Austria in 1793. He participated in all the campaigns against France, rose to the rank of major-general, and subsequently became Extraordinary Ambassador to Sweden (1814), Tuscany and Lucca (1820), Naples (1821), and Russia (1829), where he was an extremely influential agent of Metternich. In 1839 he was recalled to Vienna to assume the duties of the Foreign Office during the absence of Prince Metternich. After the Revolution of March, 1848, he was again in charge of the Department of Foreign Affairs, and had become Premier *pro tem.*, when popular feeling against him compelled him to resign. The following are his principal works: *Aufklärungen über die vom 20 März bis zum 4 Mai, 1848* (2d ed. 1850), and *Die religiöse Seite der orientalischen Frage* (2d ed. 1854).

FICTION. See Novel; Romance.

FICTION OF LAW (Lat. *fictio*, a fashioning, a feigning, from *fingere*, to fashion, to feign). A legal assumption that something is true which is known not to be true, or which may be false. The term legal fiction is used by Sir Henry Maine in a wider sense than that given to it in the Roman law or by most English-speaking lawyers. He employs it "to signify any assumption which conceals, or affects to conceal, the fact that a rule of law has undergone alteration, its letter remaining unchanged, its operation being modified." In this sense it includes every modification of existing rules of law by judicial decision. It is to this process of changing legal rules by the fiction that judges are simply declaring the law, when, in fact, they are changing it in order to make it conform to the new standards of morality or to the novel needs of society, that English common law owes its elastic and progressive character.

Examples of legal fiction, using the term in its narrow sense, are found in the old forms of pleading. In the action for the *conversion* (q.v.) of goods, the plaintiff's declaration alleged that he had lost the goods in question, and that the defendant had found them. This allegation was generally untrue, but the defendant was not permitted to deny it. By a fiction of pleading the courts of King's Bench and Exchequer came to share in the jurisdiction of the Common Pleas. Originally (as has been pointed out in the articles on COURT and EXCHEQUER) the King's Bench was a criminal court exclusively, and its jurisdiction over civil actions was obtained by permitting the plaintiff to allege falsely that the defendant was in the custody of the King's marshal for a breach of the peace, and by precluding the defendant from denying it. Having brought the defendant before the court on this fictitious charge, the plaintiff was allowed to proceed against him for any civil wrong. In a similar manner, the Exchequer extended its jurisdiction over civil actions by permitting a plaintiff to allege that he was a debtor of the King and was prevented from paying his debt by the defendant's wrongful act or default. "And these fictions of law," Blackstone observes, "though at first they may startle the student, he will find them upon further consideration to be highly beneficial and useful, especially as this maxim is invariably observed, that no fiction shall extend to work an injury, its proper operation being to prevent a mischief or remedy an inconvenience that might result from the general rule of law." Consult: Maine, *Ancient Law* (London, 1887), and the authorities referred to under CONSTITUTIONAL LAW; CUSTOM; and JURISPRUDENCE.

FICTOOR, fĭk′tōr, JAN. See VICTORS, JAN.

FI′CUS. See FIG.

FI′CUS RU′MINA′LIS. The sacred fig-tree which protected Romulus and Remus when they were abandoned on the banks of the Tiber. It stood near the Lupercal, and according to the tradition was miraculously conveyed by the augur, Attus Navius, to the Comitium. Beneath it stood the famous bronze statue of the wolf. The tree is said by Tacitus to have shown no signs of decay until 841 years after it had sheltered the twins.

FIDDLE. See VIOLIN.

FIDDLER BEETLE. See FUNGUS BEETLE.

FIDDLER CRAB. A small crab of the genus Uca (or Gelasimus) enormously abundant on muddy shores along the eastern coast of the United States south of Cape Cod. "The males have one claw very largely developed; the other chela is small. The former is likened to a fiddle, the latter to a bow, and this, together with the waving motion of the large claw, gives them their popular name. . . . The female has claws of small and equal size." The largest, commonest, and most inland-ranging species is *Uca minax*, easily distinguished by having a patch of red at the joints of the legs. Another, extending its range around the Gulf of Mexico and throughout the West Indies, is *Uca pugnax*. A third species (*Uca pugilator*) is more marine, inhabiting sandbars and beaches. All are gregarious, congregating in the salt marshes in countless numbers and making burrows in the mud, just above the line of high tide. These holes are from half an inch to two inches in diameter. They occupy them as refuges, and *Uca minax* forms of pellets of mud an arched penthouse over its hole, in which it sits and watches what goes on. All the species wander about a good deal, and when alarmed scuttle sidewise with comical speed into the first burrow they come to. They are vegetarians, feeding on minute algæ, etc., which they scrape up and put into the mouth with the smaller claws. The burrowing of this crab often does serious injury to embankments, particularly the levees near the mouth of the Mississippi. Consult: Verrill, *Invertebrates of Vineyard Sound* (Washington, 1874), reprinted in Goode, *Fishery Industries*, Section I. (Washington, 1884); and Arnold, *The Sea Beach at Ebb-Tide* (New York, 1901). See CRAB, and Plate of CRABS.

FIDDLER-FISH. See GUITAR-FISH.

FIDEICOMMISSUM, fī′dē-ī-kŏm-mĭs′sŭm (Lat., committed to faith, bequest). At Roman law, the *fideicommissum* was a trust bequest. During the republican period, a valid bequest could be made only in the form of a legacy in a regular testament. It was, however, not unusual for a person, acting in contemplation of death, but not wishing to leave a testament, or not wishing to substitute a new testament for one already made, to charge the person who was to take the inheritance, whether by law or by testament, with the duty of paying a sum of money, or giving some particular thing or things, to a third person; or to charge the person who was to receive a legacy with the duty of transmitting the legacy or some portion of it or of its value to a third person. Such directions might be given in writing (*codicilli*) or orally, before witnesses or without witnesses; but in no case, before the time of Augustus, was the duty imposed by such a charge anything more than a moral duty. Augustus made all such bequests, however informal, recoverable by action, and instituted a special court for trust-bequest cases. During the early Imperial period it became not unusual to impose upon an heir, by such a trust bequest, the duty of handing over to a third person the entire estate or some fractional part of it (so-called 'universal' trust bequest); and it was enacted by the Senate that in such cases the third person should be compelled to accept, in proportion to the share of the estate which he was to receive, the position and obligations of an heir or universal successor. The effect of this whole development was that testation was practically freed from all formalities. In the late Empire a reaction occurred in favor of greater formality; and in the Justinian law a codicil with five witnesses was required for the establishment of trust bequests. Justinian, indeed, enacted that an oral charge imposed upon the heir should be actionable, but excluded all evidence except that of the claimant and the heir, and provided that the heir should be freed upon taking oath that he had received no such charge. *Fideicommissa* were introduced and developed to accomplish ends that could not be accomplished at the Roman law by testament. By a trust of this sort it was possible, for example, to leave the ownership of an entire estate or of a particular piece of property to one person for a definite term or for life, or subject to a condition subsequent, and then to another person (*substitutio fideicommissaria*). Arrangements of this character are permitted, with limitations, in the Spanish civil code (secs. 781-786), and in the French civil code (secs. 1048-1074). In the German Imperial Code the same result is reached through what is termed post-inheritance (*nacherbschaft*). In German law *fideicommiss* has become the technical term for an estate permanently entailed. Consult the authorities referred to under Roman Law; Civil Law.

FIDEI DEFEN′SOR. See Defender of the Faith.

FIDE′LE. The assumed name of the disguised Imogen in Shakespeare's *Cymbeline*.

FIDELIO, fē̇-dā′lyō̇. Beethoven's only opera (1805). The name is assumed by Leonora, wife of Fernando Florestan, who in male attire becomes an attendant in the jail where her husband is confined. The opera was to have been called 'Léonore,' and the 'Leonora overtures' were written for *Fidelio*.

FIDE′NÆ. An old and important city situated on a hill (now Castel Giubileo) on the south bank of the Tiber, about five miles above Rome, and supposed to have been founded by the Etruscans. It is said that no other city played so important a part in the history of early Rome as did this city. As early as the days of Romulus ill-will, with frequent strife, existed between the two cities, and continued, with short intervals of peace, until B.C. 496, when the Fidenates were forced to surrender. In B.C. 438 they revolted again, killing the Roman ambassador, and they were not subjugated until B.C. 426, when their city was taken, and they were sold into slavery. During the Republic and the Empire it was only a small country village, remarkable chiefly for a terrible calamity which occurred during the reign of Tiberius, when about 50,000 persons were killed by the fall of an amphitheatre during a gladiatorial contest. No ruins of Fidenæ exist, beyond a few rock-cut tombs and drains. Consult Dennis, *Cities and Cemeteries of Etruria*, vol. i. (London, 1883).

FIDES′SA. The name taken by Duessa to ensnare the Red-Cross Knight in Spenser's *Faerie Queene*.

FIDUCIARY (Lat. *fiduciarius*, relating to a trust, from *fiducia*, trust, from *fidere*, to trust). A legal term designating a person in whom peculiar trust and confidence are reposed by another, or the relation which subsists between such persons; or a liability incurred by one of these persons toward the other. The most important examples of fiduciary relations are those of parent and child, of guardian and ward, of lawyer and client, of physician and patient, of trustee and *cestui que trust*, of principal and agent, of principal and surety, and of partners. When the relationship does exist the rule obtains that the fiduciary—the person in whom a special confidence and trust is reposed—is bound to act toward the other party to the relation with the utmost good faith. If he receives a gift from the other, or enters into a contract with him, and its validity is challenged, the burden of proof is upon him to show that he took no advantage of his influence or knowledge, but, on the contrary, that the other acted with perfect freedom as well as with full knowledge of all the facts relating to the transaction. Indeed, in England a much stricter rule than this is applied to gifts from clients to legal advisers made during the continuance of the relationship; they may be set aside upon the application of the client or his personal representatives. In other words, the presumption of undue influence in such a case is conclusive. A trustee or an agent, charged with the sale of property belonging to his *cestui que trust*, or his principal, is not allowed to become the purchaser or to make any secret profit out of the sale.

The term 'fiduciary capacity' in the United States bankruptcy statutes has received a narrow construction. By these statutes debts contracted 'in any fiduciary capacity' are excluded from the operation of a discharge in bankruptcy. It has been ruled by the United States Supreme Court that the term in this connection includes only debts contracted by technical trustees—that is, trustees appointed by will or by deed or by order of a court, and does not extend to debts owing by agents or attorneys to their principals. Consult: Bigelow, *Elements of Equity, for the Use of Students* (Boston, 1879); Lowell, *The Law of Bankruptcy* (Boston, 1899); and the authorities referred to under such titles as Trustee; Agent; etc.

FIDUS ACHATES, fī′dŭs ȧ-kā′tēz. See Achates.

FIEBRES, fyā′brȧs (Sp., fevers). A name given to the Liberal Party in some countries of Central America.

FIEF. The name by which an estate held under the feudal system by noble tenure was designated. Originally it was held only during the lifetime of either party to the contract, but gradually it became hereditary, and by the tenth century the evolution was complete. It was formerly wrongly supposed that the change was brought about by the edict of Kiersy (q.v.). The legal name for fief was 'benefice' (*beneficium*), and the holder was the 'beneficiary.' The unit fief was the knight's fee, which was required in England to furnish one armed knight for forty days per year for the army. See Feudalism.

FIELD (AS., OHG. *feld*, Ger. *Feld*, field; connected with AS. *folde*, Icel. *fold*, soil, and ultimately with Gk. πλατύς, *platys*, Lith. *platùs*, Skt. *pṛthu*, broad, and with OHG. *flaz*, Icel. *flatr*, Eng. *flat*). In heraldry (q.v.), the whole surface of the escutcheon.

FIELD, Inspector. A head detective of the London police, in Dickens's *On Duty with Inspector Field*. The character had its prototype in real life.

FIELD, Cyrus West (1819-92). An American financier, the projector and promoter of the first submarine telegraph cable between Europe and America, born at Stockbridge, Mass. He was the brother of David Dudley Field, the eminent lawyer, and of Justice Stephen J. Field of the United States Supreme Court. At the age of fifteen, abandoning the idea of a college education, he removed to New York City. At the end of three years he removed to Stockbridge, but two years later he again removed to New York. He was at first in the employ of A. T. Stewart, and afterwards junior partner in a firm of paper merchants. A disastrous failure having ensued, Field effected a temporary settlement with the creditors and set up in an independent business. Close application finally rewarded his efforts; he took his brother-in-law into partnership, and on January 1, 1853, at the age of thirty-three, retired from active participation in the business, with a fortune of $250,000.

A meeting with Frederick N. Gisborne (q.v.), a Canadian electrical engineer, in 1854, determined the channel into which Field's indomitable energy was to be turned. Gisborne was in New York attempting to interest capitalists in an undertaking to construct an overland telegraph line across Newfoundland, connecting Cape Ray and Cape Breton by fast steamships or carrier pigeons, and perhaps, eventually by a submarine cable under the Gulf of Saint Lawrence. Field took Gisborne's plans under advisement, and, in studying up the matter, became convinced not only that the scheme was practicable, but that the time was opportune for organizing a company to lay a transatlantic cable from Newfoundland to Ireland. He was not the first to entertain such an idea, but he was the first to put it into operation. With this more extended purpose in view, Field set to work to interest some of his friends, with the result that in May, 1854, was organized the New York, Newfoundland and London Telegraph Company, with Peter Cooper as its president. In 1856 the United States Government, at Field's request, sent Lieutenant Berryman in the *Arctic*, to take deep-sea soundings along the route of the proposed cable, with the result that the existence of the telegraphic plateau was confirmed. A British expedition under Lieutenant Dayman, sent also at Field's solicitation, further confirmed this fact. In August, 1857, the first attempt at laying the cable was made from Valentia, on the Irish coast. It failed, but in June, 1858, attempts were resumed. Time and again a start was made, but always unsuccessfully, 200 miles being the greatest length laid.

In spite of these disheartening failures, Mr. Field did not despair, and in July another attempt was made, this time with success. On August 16, 1858, the first message was transmitted from Queen Victoria to President Buchanan. But even while the success of the undertaking was being celebrated the cable broke. Mr. Field's firm had failed as a result of the panic of 1857, and he was now compelled to go into bankruptcy. Still he did not lose heart, nor give up his faith in the ultimate success of a transatlantic cable. A contract was let to an English construction company, a new cable was constructed, weighing 300 pounds to the mile instead of 107 pounds, the weight of the old cable, and the *Great Eastern*, the largest steamship afloat, was chartered to lay it. On July 23, 1865, the *Great Eastern*, with Mr. Field on board, started westward from the Irish coast, near Valentia, but the cable broke within 600 miles of the Newfoundland coast. On July 13, 1866, the *Great Eastern* started from Valentia on her second, and this time triumphant, voyage. The Newfoundland coast was reached on July 27th without a mishap, and the land connection was successfully made. From this time on communication with Europe by telegraphic cable was undisturbed. The succeeding years were spent by Mr. Field in railroad development. He was one of the original projectors of the elevated railroad system in New York City, resigning its presidency and that of the Wabash, Saint Louis and Pacific Railway in 1880, on retiring from active participation in business. Business reverses troubled his last years. Consult: Isabella Field Judson (his daughter), *Cyrus W. Field: His Life and Work* (New York, 1896); also H. M. Field, *History of the Atlantic Telegraph* (New York, 1867); Reid, *The Telegraph in America* (New York, 1878); Bright and Bright, *Life of Sir Charles Tilston Bright* (London, 1898); Russell, *The Atlantic Telegraph* (London, 1868).

FIELD, DAVID DUDLEY (1781-1867). An American clergyman and historical writer. He was born in East Guilford, now Madison, Conn.; graduated at Yale in 1802, and, after studying for the Congregational ministry, held pastorates at Haddon, Conn., and at Stockbridge, Mass. He was the author of several local histories, including *A History of the Town of Pittsfield, in Berkshire County, Massachusetts* (1844); and of a *Genealogy of the Brainerd Family* (1857).

FIELD, DAVID DUDLEY (1805-94). An eminent American lawyer; son of David Dudley Field, a Congregational clergyman (q.v.). He was born at Haddon, Conn., graduated at Williams College in 1825, studied law first in Albany, N. Y., and afterwards in New York City, and was admitted to the bar in 1828. He commenced practice in New York, and speedily acquired a leading position at the bar. This was due quite as much to his extraordinary energy and public spirit, and to his zeal for law reform, as to his unusual learning and skill as a lawyer. Though possessed of a large professional practice, he devoted all the time which he could spare from pressing engagements for forty years to the reform of the law. He began the movement by writing articles in reviews and papers and pamphlets, showing the urgent necessity of a reform in methods of legal procedure. Having been appointed in 1847 a commissioner on practice and pleading by the Legislature of New York, he devoted himself first to the preparation of a code of civil procedure which was promptly enacted into law. The design of the new system was to wipe out the distinction between the forms of action and between legal and equitable remedies, in order that all the rights of the parties in relation to the subject of legislation could be decided in one and the same forum and in a single action. This system has been adopted in most of the American States and is the basis of the reformed procedure established in England by the Judicature Act of 1873 (36 and 37 Vic., c. 66). The same commission framed a code of criminal procedure, which has been adopted by eighteen States and Territories. In 1837 Mr. Field was placed at the head of a new commission to prepare a political code, a penal code, and a civil code, which were finished and reported in 1875, but which, owing to the bitter opposition of the bar of the State, and especially of New York City, has never been adopted by the State of New York, though the civil and penal codes were passed by the two Houses, almost unanimously. in 1879, and failed only for want of the Governor's signature to become the law of the State. They have been of great service, however, in the legislation of these States, especially in California and Dakota, where they were adopted with a few alterations that were necessary in order to adapt them to local conditions.

But Mr. Field's interest in reform was not confined to the civil or municipal law, but embraced the widest field of international relations. In 1866 the British Association for the Promotion of Social Science held a meeting at Manchester, at which Mr. Field made a proposal for a general revision and reform of the law of nations, similar to that aimed at in his labors for the reform of the civil and criminal law. Acting on his proposal, he completed in 1873 a work entitled *Outlines of an International Code,* which he presented to the social science congress of that year, and which met with very favorable criticism from eminent jurists all over the world. In 1873 he was elected first president of an association for the reform and codification of the law of nations, formed at Brussels in that year.

Mr. Field was a lifelong Democrat in his political convictions, but belonged to the 'Free-Soil' and anti-slavery wing of that party before the Rebellion, and during the war was a stanch supporter of the Administration of Lincoln. The only party office ever held by him was that of Congressman, which he occupied by appointment for a short time in 1876 to fill a vacancy. Though distinguished in many ways, his fame rests chiefly on his achievements as a law reformer, in which field of high and disinterested service he occupies a foremost place. Many of his principal papers on law reform are included in his *Speeches, Arguments, and Miscellaneous Papers* (New York, 1884-90).

FIELD, Eugene (1850-95). An American poet and journalist, born in Saint Louis, Mo. During several years of his childhood he lived in Massachusetts and Vermont, and, though he completed his collegiate education in Missouri, he showed in his work traces of New England and Western elements which co-existed rather than blended in his nature. At twenty-three he began newspaper work, and ten years afterwards he became associated with the Chicago *Daily News,* with which he was for twelve years identified through his column "Sharps and Flats." Far the largest part of his literary production first appeared here. It is of varied manner and quality, prose and verse, detached paragraphs and continued narratives, by turns quaint, grotesque, delicate, Rabelaisian, farcical, and pathetic. He seemed to have equal sympathy with the wild life of the prairie and with classic culture, for irresponsible Bohemian life and quiet domestic felicities. He is probably most widely known as a poet of childhood, but most admired as a scholarly humorist. His first publication, *The Denver Tribune Primer* (1882), is one of the cherished rarities of the book collector. *Culture's Garden* (1887) contains clever skits at the pretense of culture. *A Little Book of Western Verse* (1889) and *A Little Book of Profitable Tales* (1889) are characteristic of his best original literary achievement. *Echoes from a Sabine Farm* (1895) show how fully he had absorbed the spirit of the Roman Horace. *The Love Affairs of a Bibliomaniac* contains his most delicately humorous essays; *With Trumpet and Drum* (1892), his best verses for children. The posthumously published *The House* (1896), and *Sharps and Flats* (2 vols., 1900), add nothing to his reputation. Consult Thompson, *Eugene Field, a Study in Heredity and Contradictions* (2 vols., New York, 1901).

FIELD, Frederick (1801-85). An English clergyman, born in London. He graduated at Trinity College, Cambridge, in 1823, and was rector of Reepham, Norfolk, from 1842 to 1863. He edited the Greek text of Saint Chrysostom's *Homilies on Saint Matthew* (1839); Saint Chrysostom's *Interpretation of the Pauline Epistles* (7 vols., in *Bibliotheca Patrum,* 1845-62); the Septuagint version of the Old Testament, according to the Alexandrian codex (subsequently revised and rearranged for the Foreign Translation Committee of the Society for Promoting Christian Knowledge); and Origen's *Hexapla* (2 vols., 1867-75).

FIELD, Henry Martyn (1822—). An American clergyman, editor, and author, born at Stockbridge, Mass., a son of Rev. David Dudley Field and brother of the jurist of that name, as well as of Justice Stephen J. Field and Cyrus W. Field. He graduated at Williams (1838), studied theology, and from 1842 to 1847 was pastor of a church in Saint Louis. Then, after three years of European travel, he became pastor of a church in West Springfield, Mass. (1851-54). After this he took up his residence in New York as editor and later, till 1890, as sole proprietor of the *Evangelist,* an organ of the Congregational Church, visiting Europe frequently, and making a tour of the world in 1877. His numerous volumes are chiefly stories of travel. Of these *From the Lakes of Killarney to the Golden Horn* (1876); *On the Desert* (1883); and *Old Spain and New Spain* (1888) are sufficiently typical. He also wrote a life of his brother, David Dudley Field, and miscellaneous books.

FIELD, John (1782-1837). An English composer, born in Dublin. He was the immediate precursor and probable model of Chopin and the modern school of pianoforte composition. Field came of musical stock. His father was a violinist and his grandfather, of whom he took his first lessons, an organist. Subsequently, when the family removed to London, he was apprenticed to Clementi, who then had a pianoforte business and who, recognizing the youth's remarkable gifts, taught him, and employed him to show off pianofortes to customers. With Clementi he went in 1802 on an extended concert tour, visiting Paris, Germany, and Russia, where his pianoforte playing was greatly admired. On a second visit to Saint Petersburg in 1804 he remained there as a much admired teacher and virtuoso. He did not return to London until 1832, appearing there most successfully in concert. A subsequent tour in Italy proved a failure. Under the effects of disappointment and dissipation he broke down at Naples, where, nine months later, he was taken out of the hospital by a Russian family with whom he returned to Moscow. But he never recovered his health, and died in Moscow. Field's works that have survived are his *Nocturnes.* They were the first successful efforts at composition unrestrained by classical form and offering the composer freedom of poetic fancy. In their name, their romantic and subjective treatment, as well as in their technical aspect, they clearly indicate the starting-point of Chopin and of the modern romantic school. His works include 7 concertos (No. 4 of which was the most popular); 4 sonatas; 2 airs en rondeau; 4 romances; 18 nocturnes, and numerous other pieces of kindred type. An essay on Field by Liszt and reminiscences of him in Spohr's autobiography will be found interesting.

FIELD, JOSEPH M. (1810-56). An American actor and dramatist. He was born in London, England; came to America when very young, and for several years traveled through the States writing plays and acting them, without attaining much reputation. In 1852 he assumed the management of a theatre in Saint Louis, Mo., where he was also later principal owner and an editor of the *Reveille* newspaper. At the same time he became widely known for his humorous sketches signed 'Straws' in the New Orleans *Picayune.*

FIELD, KATE (c.1840-96). An American journalist, lecturer, and actress, of eccentric talent. She was born in Saint Louis, Mo., the daughter of Joseph M. Field (q.v.); was educated in New England and in England; and prolonged her stay in Europe as correspondent of various American newspapers, writing also for magazines. On her return she gave lectures and public readings, and in 1874 appeared as Peg Woffington at Booth's Theatre, New York. She afterwards abandoned the regular comedy for dance, song, and recitation, but achieved no striking success. In 1882-83 she headed a Coöperative Dress Association in New York, which achieved a conspicuous failure. In 1889 she established *Kate Field's Washington,* a weekly journal published in the capital. After 1868 she published numerous volumes of miscellaneous contents, no longer noteworthy.

FIELD, MAGNETIC. See MAGNETISM; DYNAMO-ELECTRIC MACHINERY.

FIELD, MARSHALL (1835—). An American merchant, born in Conway, Mass. He was a clerk for a time in a shop in Pittsfield, Mass., and in 1856-60 in Chicago in a wholesale dry-goods establishment, in which he was a junior partner from 1860 to 1865. In 1865 he became a member of the firm of Field, Palmer & Leiter, which, after the retirement of Potter Palmer in 1867 and of L. L. Leiter in 1881, assumed the style of Marshall Field & Company. Under his direction the firm obtained the largest wholesale and retail dry-goods business in the world, with headquarters in huge buildings in Chicago, and branches in France, Germany, and England. He gave to the University of Chicago land valued at $200,000, and with a gift of $1,000,000 founded in Chicago the Field Columbian Museum as a permanent repository for many exhibits of the World's Columbian Exposition of 1893.

FIELD, MICHAEL. The carefully sustained pseudonym of two English women collaborators, generally understood to be Miss Bradley and Miss Cooper, who have written several remarkable poetic dramas and many beautiful lyrics: *Callirrhoë and Fair Rosamond* (1884); *The Father's Tragedy* (1885); *Canute the Great* (1887); *The Tragic Mary* (1890); *Long Ago* (1889); *Sight and Song* (1892); *Under the Bough* (new ed. 1893); *Attila, my Attila!* (1895); *Anna Ruina* (1899); *The Race of Leaves* (1901).

FIELD, RICHARD (1561-1616). A Church of England divine. He was born at Hemel Hempstead, Hertfordshire, October 15, 1561, and graduated B.A. at Oxford in 1581. After a brilliant university career as instructor and scholar, he became in 1594 rector of Burghclere, Hampshire, and there and at Windsor, where he was a prebendary after 1604, he chiefly resided henceforth. In 1610 he was made Dean of Gloucester. He attended the famous Hampton Court Conference in 1603, and enjoyed the special favor of King James. His fame rests upon his great work, *Of the Church* (London, 1606, modern edition 1853), one of "the grandest monuments of polemical divinity in the language."

FIELD, STEPHEN JOHNSON (1816-99). A distinguished American judge, born in Haddam, Conn., in 1816. He was the second son of the Rev. David D. Field, D.D., and a brother of the eminent jurist and law-reformer, David Dudley Field. A younger brother was Cyrus W. Field, to whose energy and enterprise the success of the first Atlantic cable was chiefly due. At the age of thirteen young Field made a voyage to the East in company with a brother-in-law, who was a missionary, and he spent three years in Smyrna and Athens, studying Greek and other languages. Returning to this country, he graduated at Williams College, in 1837, with the highest honors. He then studied law in the office of his brother in New York City, and, after his admission to the bar, became his brother's partner, and devoted himself energetically to the practice of law until 1848, when he went abroad and passed a year in Europe. On his return, in 1849, he joined the tide then setting toward California, and established himself there, at a place where now stands the city of Marysville. He was elected the first alcalde of the place, holding the office until the organization of the judiciary under the Constitution of the State. Under Mexican law an alcalde had a very limited jurisdiction, but after the American occupation the jurisdiction exercised by him in the anomalous condition of society in California at that time was practically unlimited. In 1850 he was elected to the Legislature, and was placed on the Judiciary Committee. He drew up a bill defining the powers of the courts of justice and judicial officers of the State, which was passed, and most of its provisions are still retained in the California code. He also secured the passage of a law giving effect to the usages and regulations adopted by the miners for the protection and working of the mines. The principles embodied in this law were adopted in other mining regions of the country, and finally by the Congress of the United States. In 1857 he was elected Judge of the Supreme Court of California, and in 1859 he succeeded David S. Terry as Chief Justice. When Mr. Field came to the bench, the titles to lands in the State were unsettled, and it was largely through the decisions in which he delivered the opinions of the court that the law of real property in California was placed on a permanent basis. In 1863 he was appointed by President Lincoln an Associate Justice of the Supreme Court of the United States, a position which he held with increasing distinction until 1897. Here he played a conspicuous and important rôle, expressing himself with great force and freedom on all the great constitutional questions which came before the court for consideration during his long term of service, and being intrusted by the court with the duty of preparing some of its most important opinions. His opinions in the celebrated test-oath cases, in which the Supreme Court declared the invalidity of the 'ironclad oath' imposed by act of Congress on all persons holding office under the Government of the United States, and his dissenting opinions in the legal-tender, slaughter-house, and income-tax cases were distinct contributions to American constitutional law, and have become justly celebrated. In 1869 he was appointed professor of law in the University of California; in 1873, as one of a commission to examine the codes of the State, he prepared amendments which were adopted by the Legislature. He was a member of the famous electoral commission of 1876 which decided the Presidency in favor of Rutherford B. Hayes, and he voted with the minority in favor of Samuel J. Tilden. As a judge, Field was noted for his independence of judgment and the strength of his convictions, as well as for the sanity and reasonableness of his views. He was a learned lawyer, but it was the breadth of his information and the range of his experience which contributed most to his judicial equipment. His service on the bench of the Supreme Court, the longest in the history of that august tribunal, was also one of the most useful in its history.

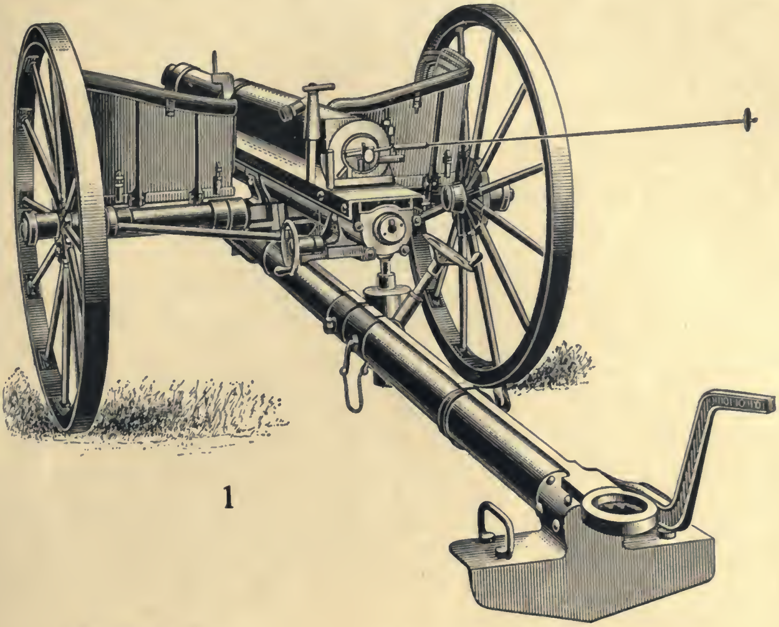
FIELD ARTILLERY. In the contest for military superiority among the great powers of the world, the greatest activity, the heaviest expense, and the largest number of experiments are in the direction of the development of field artillery. The twenty years succeeding the Franco-Prussian War saw practically no transformations of field-artillery material. At the end of these two decades the usual method of correcting defects by remodeling old types had become impracticable. The years 1890-92 marked the end of the old systems (see ARTILLERY), and the beginning of experiments, culminating in a general rearmament, which at the opening of the twentieth century has been practically completed. The gun of 1890, a comparatively modern breech-loading rifle, was already considered no longer good enough in 1900. The result of this rivalry of nations is the present rapid-fire field gun, a single one of which will deliver more aimed shots in a minute than a whole battery of the old guns. In nearly all of the yearly budgets of European military powers extraordinarily large credits appear for the purchase of new field-artillery material. An idea of the enormous expense incurred may be obtained from the fact that the cost of a single complete gun and carriage is, in round numbers, $5000, and each military nation requires several thousand of these weapons.

The considerations governing the establishment of a system of field artillery are briefly as follows: The maximum weight to be drawn by the team of four or six horses; say 3500 to 4500 pounds in Europe, for a six-horse team. It is generally agreed that the weight for field artillery should not be greater than 724 pounds per horse, and the weight for horse artillery 618 pounds per horse; however, these figures are considerably exceeded in practice. In general terms it may be said that to increase the weight decreases the mobility, but increases the stability when firing. After having determined the maximum weight the problem is to get the greatest rapidity of fire, the highest ballistic power, and the most destructive projectile possible within these limits. Other important considerations closely allied to these are mobility, stability of carriages, accuracy of fire, and many other details, of interest only to technical readers. Even with the numerous improvements that have been made in field guns, it has recently been found necessary to have a more effective long-range weapon against troops under cover, in intrenched positions, behind walls, natural irregularities of the terrain, etc. This has brought about the adoption in different countries of one or more of the following devices for this purpose: the field mortar or howitzer, the torpedo shell, and the use of varying charges in the ordinary field gun.

The standard field gun in all countries is so nearly similar that it is not necessary to describe each one separately. As being one of the most modern and at the same time one of the most powerful weapons of this class, a brief description of the proposed Swiss gun, provisionally adopted in 1901, is here given. This gun was manufactured by Krupp, and is the result of several years of careful study on the part of the Swiss technical commission appointed for the purpose. It is of nickeled steel of 7.5 cm. (about three inches) calibre, provided with a sight of the Corrodi system. The breech mechanism is a wedge of the Leitwell system. Obturation, as the act of closing the breech of the gun to prevent the escape of gas is termed, is secured by the metallic cartridge-case; the trigger is a repeater, the firing spring armed only at the instant of fire, and a safety arrangement permits the piece to be manœuvred without danger while it is loaded. The carriage is a rigid one, with a spring trail spade, provided with a traveling brake, which may also be used for a firing brake. In firing the whole piece recoils upon the spade, which relieves itself by compressing the column of springs, whose extension causes the return of piece to 'battery,' as the position of readiness for firing is technically known. The ammunition consists of shrapnel with metallic cartridge-case. The cartridge-case can be used ten or twelve times; the shrapnel has a double-action fuse made of aluminum, and its effective range is 5600 meters (over 5750 yards). The limber of the piece and caisson are identical, each carrying 40 pounds; the caisson-body is composed of a single chest carrying 56 pounds.

The armament of the field artillery of the various nations of the world varies to a certain extent with different armies, and is constantly changing with the new developments of each succeeding year. The main features of the equipment of the more important powers, as far as can be determined from the small amount of information allowed to leak out, are given in the succeeding paragraphs.

FIELD ARTILLERY



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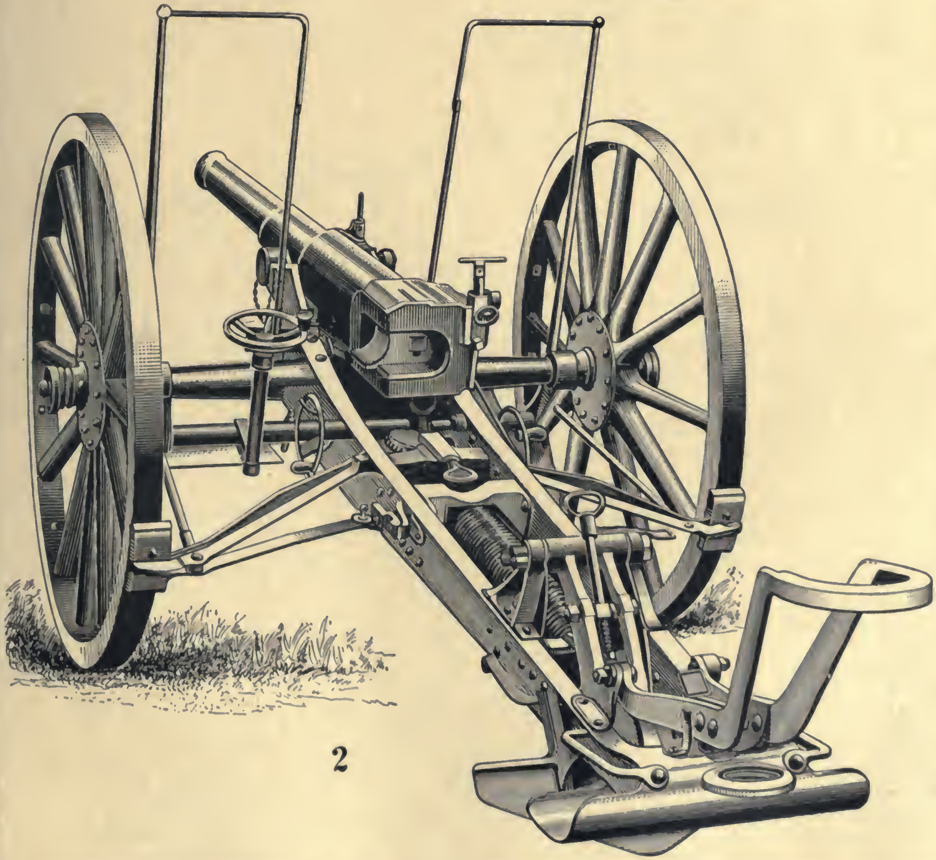


2

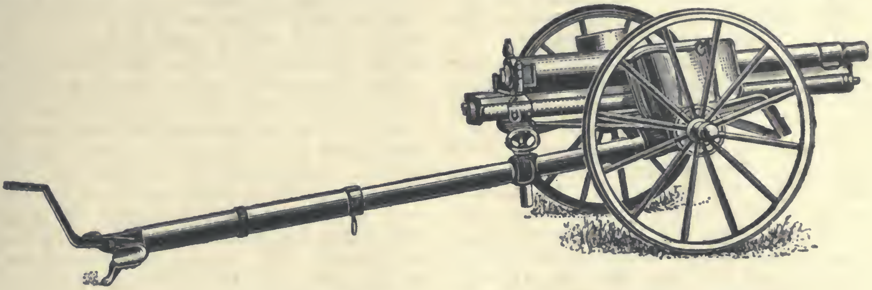
1. EHRHARDT FIELD GUN

2. SWISS FIELD GUN

United States. The field guns proper in the United States service are the 3.2-inch gun, the 3.6-inch gun, and the 3.6-inch mortar (see accompanying table). The 3.6-inch gun is a breech-loading rifle of greater weight and power than the 3.2-inch gun, which latter is more especially adapted to the service of the horse-artillery arm. The gun is essentially the same, as to form and characteristics, as the 3.2-inch gun, weighing 1181 pounds and using a 20-pound projectile. The 3.6-inch breech-loading field mortar for vertical fire is used to reach troops protected by intrenchments or otherwise from the direct fire of the field guns. It fires the same projectiles as the 3.6-inch field gun, and has an extreme range of about two miles. Reduced charges are used for the shorter ranges. The mortar weighs 244 pounds, and uses a charge of 15 pounds of powder with a 20-pound projectile.

The United States has 30 batteries, six guns each, of field artillery, being about 2.4 guns per 1000 men in the army.

Extensive tests of field-artillery material were held in 1902. The choice of weapons narrowed to a gun of the United States Ordnance Department, invented by Captain Wheeler, United States Army (see Ordnance), and the famous Ehrhardt gun, brought out by an amalgamation of German firms with headquarters at Düsseldorf. The Ehrhardt, which undoubtedly opened up a new phase of the quick-firing gun question as far as the European Powers are concerned, is one of the two really 'rapid-fire field guns' in existence to-day, the other being the mysterious French guns. In the United States tests, the Ehrhardt gun fired 45 armed shots, involving two changes of trail, in 6m. 18sec.; 15 aimed shots at a range of 1000 yards struck in a rectangle of 4½ by 5 feet. It is impossible to fire the gun before it is safely locked, the eccentricity of the block not bringing the firing-pin into line with the primer until the block is safely locked. The commission appointed to report on these tests and consider the question of the most suitable weapon decided upon a gun which combined the best and essential features of both. This new gun has a calibre of 3 inches, and fires a projectile fifteen pounds in weight at about six times the rate of speed that the older United States field guns are capable of. Fixed ammunition is used and the projectile will have an initial velocity of 1700 feet per second. With the increased rate of fire one of the new guns will be able to throw as many shells as a whole six-gun battery of the form which it succeeds.



EHRHARDT FIELD GUN.
Side-view, with trail extended.

By 1902 the English had acquired 18 complete batteries of these guns. More recently Norway ordered 22 of these batteries. The Ehrhardt gun caused Switzerland to hesitate when almost in the act of rearming her field artillery with Krupp guns. Germany and Austria made extensive tests of these guns, and Krupp, Schneider-Canet, and Saint Chamond have all produced 'long recoil' carriages in place of former designs. The Ehrhardt carriage is composed of two parts—the lower, which includes the wheels, axle, and telescopic trail, and the upper, which includes the U-shaped cradle which contains the hydraulic spring buffer, allowing of about 47 inches recoil.

Austria. The new field gun is of cast steel, calibre 7 cm. (2.76 inches), using a metallic cartridge separated from the projectile. Six batteries of these guns (36 guns) were issued in 1901 to the troops for trial. For curved fire the Austrian artillery has the 15 cm. (5.9 inches) mortars and howitzers in what are called 'mobile siege batteries,' of which there are five groups, each group comprising three batteries and a park of siege ammunition. Each battery has four siege howitzers, to which is attached a company of fortress artillery requiring for mounted instruction 18 drivers and 22 horses. This howitzer is of bronze, weighs 2491 pounds, with all its accessories weighing 2976 pounds. The ordinary shell weighs 70 pounds. Canister is also used. Three are four charges of smokeless powder varying from 9 to 26 ounces, and giving velocities of 538 foot-seconds to 854 foot-seconds for the ordinary shell and 512 foot-seconds to 905 foot-seconds for the shrapnel. The field artillery has a torpedo shell weighing 15¾ pounds loaded with 'ecrasite,' which is furnished with a double-action fuse, and has an initial velocity of 1460 foot-seconds; this shell to be used against troops under cover. Each battery of eight guns carries 15 shells of this kind, or 11.7 per cent. of the whole number carried (1024). The old 9-cm. gun (1875) has been considerably modified, so that it now fires six shots per minute, using a shrapnell shell which weighs 6.9 kilograms (15.2 pounds), and contains 250 bullets, each weighing 13 grams (somewhat less than one-half ounce). Austria had, in 1900, 56 regiments of field artillery, consisting of 1583 officers and 25,502 enlisted men. The guns numbered 1048, which is 2.98 guns for every thousand men in the whole army.

Belgium. The field artillery consists of eight regiments and four special companies, having 633 officers and 8632 men, until recently supplied with 204 Krupp guns, model of 1878, which have since been replaced. Various modifications of the old material now permit about twelve aimed shots per minute against the four of which the guns were formerly capable. The Hotchkiss machine gun, having proved satisfactory in recent tests, has been adopted, and eight of these weapons were purchased and issued to the troops in 1900. The new field gun (calibre 75 mm.—3 inches), whose details may be seen in the table which follows, is on the Cockerill-Nordenfeldt system, and is considered a very powerful weapon. The Vickers-Maxim 15-pounders have also been adopted. For curved fire, mortars of 15 cm. (about 6 inches) and 9 cm (3.5 inches) are used.

England. The field-artillery gun is the 15-pounder breech-loader, calibre 3 inches. The five-inch howitzers fire shrapnel and shell with lyddite bursting charges. The English quick-firing guns are the 4.7-inch, 12-pounder, 6-pounder, 3-pounder (Hotchkiss-Nordenfeldt). All batteries of field and horse artillery are being converted as quickly as possible to a quick-firing system. The new guns adopted are the Vickers-Maxim. England had in 1900 in the home establishment 18 batteries of horse artillery, 14 batteries of field artillery, 4 batteries of mountain artillery, and 83 companies of garrison artillery, the entire force consisting of 1473 officers and 37,512 men, total 38,935. In the Indian establishment she had 11 batteries of horse artillery, 42 batteries of field artillery, 8 batteries of mountain artillery, and 27 companies of garrison artillery, consisting of 487 officers and 12,912 men; total, 13,399; aggregate, 52,384.

France has been making great financial sacrifices to perfect her field artillery. The 75-mm. (3-inch) rapid-fire gun (Puteaux gun) has been issued to all the field batteries. This weapon is said to have tremendous ballistic power, and to stand at the head of all field guns. More than 300,000,000 francs were expended in replacing the 80-mm. (3-inch) and 90-mm. (3.5-inch) De Bange guns by the new material. In this gun France is said to have a field gun of greater rapidity of fire than that of any other nation. This rapidity of fire is secured by the automatic return of the gun to firing position by a compressed-air or a spring cylinder, which obviates the necessity of repointing. Fifteen shots per minute may be delivered by the two men required to work the gun. The man on the left loads or serves the piece, the one on the right aims and fires it, both being protected by a shield from small-arm fire. A melinite shell is used for inanimate targets and a shrapnel, containing 300 balls, against troops, each piece carrying 92 shell and 64 shrapnel. Two other new guns have also been recently adopted, the short 120-mm. (4.7-inch) and the short 155-mm. (6-inch) light pieces, both for use against intrenched positions. There are in the French artillery 3048 field guns, or 5.17 guns per 1000 men in the army. The war strength of the French field battery is 4 officers and 180 enlisted men, 163 horses, 6 guns, 9 ammunition wagons, and 12 other vehicles. In 1900 there were 40 regiments of field artillery, with 3220 officers and 53,932 men, and African batteries with 64 officers and 3124 men.

Germany. It is only a few years since the entire field artillery of the German Empire was reorganized, and yet in 1901 still another reorganization was in progress, as new field guns, calibre 77 mm. (3 inches), and some new pieces for curved fire had been adopted shortly before. When this reorganization is completed one-eighth of the field artillery of Germany will be armed with a field howitzer, each army corps having a group of three such batteries formed into a regiment with the field artillery of the corps. This howitzer has a calibre of 10.5 cm. (4.1 inches), and weighs slightly more than the regular field gun. A high explosive torpedo shell with thick walls made of steel, weighing 16½ pounds, has been adopted for use against troops under cover. This shell has a bursting charge of six ounces of 'Granatfüllung,' and gives about 500 fragments. Each battery carries 885 rounds, of which 17 per cent. (150) are torpedo shell. Germany had, in 1900, 105 regiments of artillery, consisting of 3852 officers and 88,619 men. They had at the same time 3444 guns, which is 6.13 guns per 1000 men in the army. In 1901 they added 19 field batteries and provided 10 Jäger or rifle battalions and two infantry regiments with automatic machine guns.

Italy. The field artillery comprises 872 guns, or 3.93 guns per 1000 men in the army. The former 7-cm. (2.7-inch) and 9-cm. (3.5-inch) guns are being replaced by the new rapid-fire gun. In 1900 there was appropriated 15,500,000 francs for replacing the 7-cm. gun only, the 9-cm. being temporarily continued in the service. In 1901 there was further appropriated the sum of 60,000,000 francs for field and mountain artillery. The 90 light batteries were ordered to be armed with the new 77-mm. steel gun before the end of 1902, bronze having finally been abandoned for steel. The new gun is of the usual modern pattern with a rigid carriage, elastic trail spade and wheel-brake, used both for firing and on the road. For curved fire the Italians use a mortar, calibre 8.7 cm. (3.4 inches), made of compressed bronze, weighing 242½ pounds, and carried on mule-back. They also employ for the same purpose a torpedo shell weighing 19 pounds and containing four pounds of 'eversite' (a picric acid explosive). The carriage for this gun weighs 275 pounds. The 9-cm. field gun is also provided with varying charges and used for curved fire. In 1900 there were 24 regiments of field artillery.

Japan has 13 regiments (117 batteries) of field artillery, each composed of 1223 men and 1495 horses. Guns of the latest Italian pattern with shields of the last model are used. There is also a new quick-firing gun, designed by Colonel Krisah of the Japanese army, and manufactured for Japan by Krupp. For curved fire a Krupp howitzer with a projectile weighing about 79 pounds is used. There are also six regiments of siege and garrison artillery in the Japanese establishment. Japan could send into the field, with her 140,000 men, 370 guns, leaving behind enough for the defense of the mother country.

Russia. The field artillery in 1900 consisted of 461 field batteries, 15 mountain batteries, 30 horse batteries, 21 Cossack horse batteries, 27 howitzer batteries (6 guns each), and 5 sortie batteries. The garrison artillery consisted of 56 fortress battalions, 75 firing parks, and 16 companies; aggregate personnel, 5430 officers and 149,600 men. The field artillery has 3194 guns, being 3.51 guns per 1000 men in the army. The field artillery was reorganized in 1895, both as to personnel and material. The prime mover in this transformation was Lieutenant-General Engelhardt, and the reorganization of the material was confined to modifications of the old systems. Russia was said to have ordered in 1900, 1000 six-gun batteries of new guns called the Engelhardt system. The old field guns in Russia were on the Krupp system, made at the Obukkov works. The approximate extreme range was 4400 yards. All batteries have six guns, and each heavy field battery carries 18 projectiles in the limber and 90 in the wagons. Each light field battery has 30 projectiles in the limber and 120 in the wagons. The horse-artillery gun is similar to that of the light field artillery, but 16 inches shorter. Each battery carries 90 rounds per gun.

Spain has adopted into her field-artillery system the Vickers-Maxim 15-pounders, and she has for curved fire a bronze-steel mortar, 9 cm. (3.5 inches), and a bronze-steel howitzer, 12 cm. (4.7 inches), of the Mata system. The total number of field guns is 816, or about 4.28 for each 1000 men in the army.

Switzerland for several years has been preparing a new system of field artillery. The gun recently adopted, already described, is one of the most powerful and modern weapons in the world. In 1901 there were added to the army one machine-gun company to each cavalry brigade. Each machine-gun company is provided with eight Maxim guns, having a range of 2000 meters, the ammunition ribbon carrying 250 rounds. The weight of the gun, which is carried by one horse, is 109 kg. (about 239 pounds). In 1900 there were 56 field batteries organized into eight regiments of division artillery, four batteries to the regiment, and four regiments of corps artillery, six batteries to the regiment.

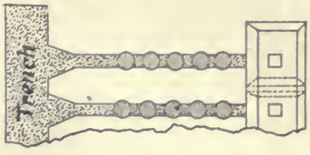
The enormous European ordnance-manufacturing companies devoting themselves to the manufacture of guns number among their customers at one time or another all the nations of the earth, both great and small. However, the principal buyers of 'ready-made' guns are the smaller nations, who have no factories of their own; for this reason there are included in the accompanying table of field guns the standard guns turned out in 1900 by the various manufacturers.

Table of Field Artillery Guns

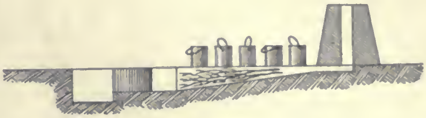
GUN	Calibre, inches	Length, inches	Gun, pounds	Gun limbered up, pounds	Projectiles		Number of bullets in shrapnel	Number of rounds in limber	Muzzle velocity feet per second
					Pounds	Ounces			
Austrian	3.42	81.1	966	4569	15	12	165	32	1740
Belgian	2.96	94.6	760	4084	14	5	......	40	1722
English	3.00	92.5	700	3653	14	...	200	38	1710
French	2.95	88.5	734	......	14	5	300	36	1570
German	3.03	106.	......	3740	15	...	300	42	1525
Italian	3.42	80.7	910	4528	15	6	176	36	1493
Russian	3.42	82.6	898	4569	...	...	......	30	1450
Spanish	3.09	79.6	710	3349	11	6	......	34	1480
Swiss	2.95	88.5	770	3722	14	15	309	40	1640
United States	3.20	90.7	800	3765	13	8	170	42	1685
Nordenfelt	2.95	79.	600	3175	14	4	159	50	1640
Call	2.95	87.	650	2750	15	11	......	36	1722
Canet	2.95	94.	650	3050	11	6	......	35	1968
Hotchkiss	2.95	84.	700	3100	15	1	212	48	1738
Ehrhardt	2.95	......	871	3650	14	2	......	36	1739
Creusot	2.95	98.	650	3400	19	1	.....	36	1837
Krupp	2.95	84.	775	3475	16	7	250	30	1722
Armstrong	3.00	94.	800	3624	13	11	185	36	1970
Vickers-Maxim	2.95	88.2	683	3818	12	8	......	36	1575
Schneider-Canet	2.95	......	804	3928	14	5	......	38	1804

FIELD-BUG. A pentatomid. See Stink-Bug.

FIELD COOKING. The method of preparing soldiers' rations in the field. Field kitchens are of two general descriptions, each type including the many varieties necessary to meet successfully the many contingencies of campaign service. Troops having good facility of transport carry with them apparatus more or less elaborate, with which—particularly in the case of the United States Army—meals can be prepared little, if any, inferior to those prepared in permanent posts. Under circumstances less favorable recourse is had to various forms of trench ovens and cooking. In most armies this forms a distinct branch of instruction, and with the general advantage of military science and hygiene is receiving more than ever before its proper share of attention. In the United States post



PLAN.



SECTION.

Fig. 1. Field cooking trench, United States Army.

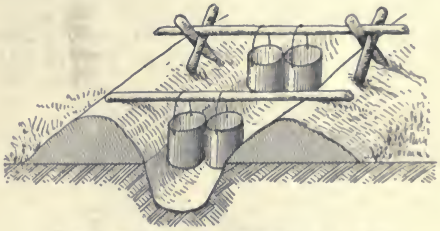


Fig. 2. Fire trench for field cooking, United States Army.

commanders are responsible for the proper instruction of post cooks, the kitchens being under the direct charge of specially trained non-commissioned officers. On campaign troops are supplied from the quartermaster's department with the Buzzacott oven, a rectangular, box-like adaptation of the Dutch oven, from 175 to 200 pounds in weight, having a top and bottom of sheet iron or steel, and measuring 25 by 35 by 14 inches; adapted for roasting, baking, frying, broiling, or stewing, easy of transportation and capable of compact packing. Where these are not available, troops are trained in the construction and use of the many improvised trench ovens in general use throughout all civilized armies. A good type of the latter is the broad-arrow form of trench used by the British Army. Two, three, or more trenches are constructed, each joining a common chimney at different angles, the mouths of which, spray-shaped, are about 18 inches in depth, the trench itself being graded from the mouth to about four inches at the chimney. Earth excavated from the trench is used in building the chimney and packing round the pans, which are placed bridgewise across the trench, confining the heat and securing good draught. The advantages of this system are its independence of transport, only a pick and shovel being required for constructive purposes; little or no skill required on the part of the troops, and, most important factor of all, a number of pans simultaneously served by one ordinary fire. The Army Service Corps of the British Army kills and prepares the fresh beef, and bakes the bread used by the troops, regimental quartermasters receiving on requisition the rations which are prepared for consumption by the regimental cooks as above described.

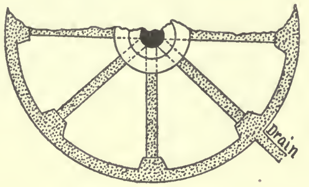


FIG. 3. BROAD-ARROW COOKING TRENCH, British Army pattern.

The armies of Continental Europe have methods similar to the United States, French troops being additionally equipped for marching purposes with a small coffee-kettle, which, together with a bundle of dried brushwood, is carried by two men of each section or platoon. When fatigued and halted for any length of time, coffee is made by them for the men of their section. One of the best descriptive and comprehensive authorities on this subject is the *United States Manual for Army Cooks*, published by the War Department.

FIELD DOG. One of a distinct class of dogs which aid men in the capture of game birds afield; bird-dogs. The group comprises pointers, setters, retrievers, and the Chesapeake Bay dog; also, incidentally, some spaniels (described under SPANIEL). The function of these dogs is to range the field in front of the hunter, and to determine by scenting the presence of the birds sought. When a pointer has located a bird or birds, he will indicate or 'point' it by stopping short with nose directed toward the spot where the game is, and he will not stir until the gunner comes up to him, when he will on order, if it be necessary, go yet nearer to the birds until they become so alarmed as to rise from their cover and expose themselves to the gun. If a setter is used he will do the like, but instead of maintaining an erect position, he will crouch or 'set,' as an indication of the bird's presence. The retriever is mainly sent into the cover after birds which have been shot but have fallen at a distance and out of sight. He scents them out, gently picks them up, and brings them to his master.

THE SETTER. Three breeds of setters are recognized: (1) The English, which is white speckled dispersedly with larger or smaller portions of black, each color standing out from the other well defined and distinct. The English setters are divisible into two main strains, the Laveracks and the Llewellins. (2) The Gordon setter, which is a rich, glossy plum-black, with deep sienna or dark mahogany-tan markings on lips, cheek, throat, and on feet and legs. (3) The Irish setter, which is uniformly colored a rich golden chestnut. The English setter has an authentic history as far back as 1555, when Robert Dudley, Duke of Northumberland, is recorded as using the setter when netting birds. The date of the origin of the Irish is more doubtful, but Gervase Markham, writing his *Art of Fowling* in 1621, and dealing with the question of the setter's colors, does not mention it. The Gordon was produced in the kennels of the Duke of Gordon about the year 1820. The setters are handsome dogs, weighing from 48 to 60 pounds (the bitches 8 to 10 pounds lighter), with soft, silky hair on the body, fringing longer on the belly and behind the legs, and longer still (the 'feather') on the under part of the tail, which tapers down, however, to a point. The hair may slightly wave, but never curl. In form they are exceedingly artistic and graceful, and in temper obedient and gentle. The head of the setter is peculiar to itself—long and keen, with a good depth from the bridge of the nose to the lower part of the lip. The shoulders should not be so heavy as to interfere with their full and free action, yet the bones should be strong and the legs well muscled. Cat-like feet, well covered with hair, are desirable. The tail, or 'flag,' is one of the most striking features. It should be carried straight out without the least inclination to turn up over the back.

THE POINTER. There are many varieties of pointers—English, Spanish, Portuguese, Russian, French, and Dalmatian (see COACH DOG), varying only, however, in size from the heavy, huge Spaniard to the diminutive Frenchman. The English and American dogs are the typical pointers. Short-coated, rat-tailed, cat-footed, without an atom of hairy padding on them, strong-boned, tight-muscled, upright, bright, great goers, and keen-scented, they are models of all a field dog should be. Though not so large now as he was in earlier days, the modern pointer is of good size, weighing generally from 50 to 55 pounds. The points of a typical specimen of this breed should include a head moderately large, wide rather than long, with a high forehead and an intelligent eye; the muzzle should be square in front; the neck long and free from dewlap or ruff; the body should have a strong loin, wide hips, and a chest well let down; a tail strong at the root and growing finer to within two inches of the tip, when it decreases to a sharp point (an unfailing indication of true pointer blood). The shoulders should be long, slanting, and powerful, the legs strong and the feet thick-soled; muscular haunches and thighs, well-bent stifles, and large, strong hocks. In color pointers vary very much. The most usual combinations are liver and white, yellow and white, and black and white. There are some whole-colored black ones, but a good admixture of white is preferable, so that the dog may be easily distinguished when he is ranging in cover.

The Retriever. This dog is most useful when the birds are aquatic or are such as haunt sloughs, from which he will gather in the killed or wounded with unerring nose. There are mainly two kinds, the English and the American, or Chesapeake Bay dog. The English variety has been generated mainly by crossing two other breeds, such as the spaniel and Newfoundland, or the spaniel and poodle, one breed tough-skinned and stiffly coated, and both dogs of remarkable powers of scenting. The rest is a matter of training. There are two distinct strains of the English retriever, the curly-coated black, and the flat or wavy-coated. The latter has the appearance of a heavily made, somewhat clumsy setter, with more bone and substance than is required in a fast field dog. The former has the body covered with short curls, though the head is smooth. The curly variety may be either black or liver-colored. Each weighs from 55 to 68 pounds. As the function of this dog is to carry dead game, the jaws should be long and strong; and that his scenting powers may have full capacity the nose should be wide, the nostrils open, and its end moist and cool.

The Chesapeake Bay dog is the American retriever pure and simple. The origin is problematic, but he derives his name, like the Newfoundland, from the home where he first became famous. He is the finest retriever in the world. No sea is too boisterous, no water too cold, no bird too big, from a Canada goose to a swan, and no wounded bird, be he diving duck or crippled woodcock, can escape his nose and swimming skill. He is a large dog, weighing 65 pounds, with a thick, short, coarse, sedge-grass-colored coat about an inch and a half in length, and with a tendency to wave over the shoulders, back, and loins, and underneath this a short woolly fur covering the whole skin. His legs are somewhat short and he is provided with well-webbed feet.

Griffon. The Germans have a field dog which they consider superior to either the pointer or setter, inasmuch as he is capable of taking the place of both those breeds. It is called 'griffon,' and sometimes 'bassett-griffon.' It is a very robust dog, with a rough, hard coat that undoubtedly is a great protection to it in a district where the undergrowth is thick and low; stands rather higher than the setter, and in color is a grizzly liver. The griffon made its first show appearance in America at the Westminster Kennel Club's Show at New York in 1901. See Dog, and consult the authorities there mentioned; and Plate of Hunting-Dogs.

Dog-Breaking. The field dog is a hunter by nature, but before requiring him to exercise his faculties to scent and locate game, and yet refrain from catching it, he must be specially trained. This training begins with yard-breaking, in which the puppy is taught to remain quiet in confinement and to become accustomed to collar and chain. His subsequent field education will depend upon his breed. Spaniels, pointers, setters, and retrievers all have different functions to perform, viz. spaniels are expected to flush their game; pointers and setters not to do so, nor are they usually expected to retrieve it, as retrievers are employed for that purpose. The most important general principle is to establish the habits of obedience and confidence, after which the dog is taught to keep at the hunter's heel until, if he be a spaniel, pointer, or setter, he is sent forward. Then he must quarter or range over his field only within certain limits of the gunner, and on signal must not exceed this limit. The next step is to inculcate the knowledge that (except in the case of a spaniel) when he has located the birds he must not flush them. To teach him to 'down' is a comparatively short process with the average well-bred dog, and keeping to heel is as easily learned. Most dogs will range when told; all they need is a direction as to where they should begin. The dog under training should be started always against the wind, that he may catch the scent. The lessons to be impressed on him are to stop when signaled, to return, and to start again. When a puppy first flushes a covey of birds he will usually proceed to chase them, a fault which is corrected by taking him back to the exact spot where he should have stopped and dropping him to hand; he will thus gradually learn to drop to wing. If a perfectly seasoned and steady dog is available when the puppy is being taught to back, it will be found to expedite the training greatly.

Field trials are competitions over definite areas, before competent judges, who follow the dogs and gunners over a game country and award prizes according to the points of merit established by each dog in the class for which it is especially fitted by nature and training. These trials are not restricted to bird-dogs. The foxhound and the beagle as well are tried out after their respective quarries. Consult: Hutchinson, *Dog-Breaking* (London, 1865); H. H., *The Scientific Education of the Dog for the Gun* (London, 1890).

FIELDFARE (from AS. *feld*, field + *faran*, to go). A thrush (*Turdus pilaris*) of northern Europe, visiting Great Britain and the Mediterranean countries in winter, and going in summer to breed in Scandinavia. The general color of the male is gray, the feathers tipped with a brownish-black elongated spot; the throat and breast reddish yellow, streaked and spotted with black; the fore part of the back and wings rich chestnut; the tail slightly forked and nearly black; the under parts white. It may generally be found in small flocks—in fields, if the weather is mild, feeding on worms, snails, etc., or, in severe weather, about hedges, thickets, and woods, wherever haws and other such fruits or seeds are abundant. It is extremely plentiful in Norway in summer, where its nests are built in birches and firs, and, contrary to the ordinary habits of thrushes, in society, numerous nests being often found in the same tree. The fieldfare is easily tamed, and sings well in captivity, the song being melodious, but not brilliant.

FIELD GLASS. A small binocular telescope constructed so as to have considerable magnifying power, and at the same time to be extremely portable. It is a Galileo's telescope with a large achromatic object-glass to secure a brilliantly lighted image, and an achromatic eyeglass which is negative or concave. The magnifying power of the field glass is ascertained by dividing the focal length of the objective by that of the eyepiece, consequently the magnifying power of such a glass is limited by the length of tubes which can be used. To obviate long tubes field glasses are now constructed where, by an arrangement of reflecting prisms placed within the tubes, the ray traverses to and fro, and the advantages of a long focal length in small compass are obtained. Field glass is a term also applied to the lens interposed between the object-glass and eyeglass of a microscope, which, receiving the diverging rays from the former before they form an image, causes them to converge, and thus contracts the dimensions of the image, and increases its brightness, so as to render it of such a size and degree of distinctness that the whole of it may be viewed by means of the eyeglass. See MICROSCOPE.

FIELD GUN. See FIELD ARTILLERY; ORDNANCE.

FIELDING, ANTHONY VAN DYCK COPLEY (1787-1855). A British water-color painter. He studied under John Varley, and devoted himself principally to marine painting. He contributed very largely to the exhibition of the Society of Painters in Water Colors, of which he was an influential member, having been its president from 1831 until his death. He is especially noted for his effects in light and mist, and found an ardent admirer in Ruskin. In later life his work declined, but he was, nevertheless, one of the most distinguished of English water-colorists.

FIELDING, HENRY (1707-54). An English novelist, not improperly called the father of the modern novel. The son of Gen. Edmund Fielding, he was born at Sharpham Park, near Glastonbury, in Somersetshire, April 22, 1707. He belonged to the younger branch of the Earls of Denbigh, and his aristocratic spirit showed itself in many of the political controversies of later life. Life at Eaton was followed by two years' attendance at the University of Leyden, where he studied law. On returning to England, it was necessary for Fielding to win his way for himself, as his father was richer in children than in more material treasure. He determined on play-writing, and for ten years contributed generously to the stage. Some twenty-five plays make up the total of this period, but none of them showed sufficient dramatic art to insure permanence, although they contained sufficient political satire to give rise to the Lord Chamberlain's censorship of the drama. The interest of the dialogue in parts, and the humor which one so readily associates with Fielding, are not lacking in them, while the plots of many show that he had the story-teller's gift; but on account of a desire to adapt his plays to the taste of the times, and an inability to comprehend as well as to rise to the heights of dramatic possibility, his dramatic work is forgotten. *Love in Several Masques* has an historical interest, as it was the first to be produced (1728), and so introduced Fielding to the public; while *Don Quixote in England* is worth at least a mention, as it suggests his liking for Cervantes. To Cervantes Fielding looked back as afterwards Thackeray looked back to Fielding, and as we read *Don Quixote, Joseph Andrews,* and, say, *Henry Esmond,* we note how the warm, genial, honest blood runs truly and similarly through the veins of these authors. All three have insight into men's characters, and power to see beneath the surface of life alike high and low; all three have the saving grace of humor, the sincere hatred of hypocrisy, the pleasant faculty of personal interpolation and friendly interpretation of men and things. The two Englishmen, indeed, lacked the genius for noble idealization which Cervantes possessed; but all three were optimists in a world whose evil they plainly discerned and described, and the winningness of their work is not lessened by that splendid power of satire which in Thackeray and Fielding was directed against the affectations and hypocrisy of their own times and society, exposing the ridiculous in life, while in Cervantes it dealt more nearly with what pessimists look upon as the satire of the universe, the seeming futility of ideal endeavor.

Fielding's reputation is based for the most part on three novels: *Joseph Andrews* (1742); *Tom Jones* (1749); and *Amelia* (1751). *Joseph Andrews* was planned to be a parody on Richardson's *Pamela,* the sentimental, moralizing novel in which the poor heroine is rewarded for her virtuous resistance to the nobleman, her lover, by the offer of marriage which Fielding suggests may have been one of the motives of her chastity. Joseph Andrews, the handsome, pure-minded footman, was, as brother of Pamela, to parallel his sister's virtuous conduct; but before the story had progressed far the author became so interested in the characters he had set in motion that the parody purpose was set aside, and the novel developed as an original and independent work of fiction. Parson Adams, the stalwart, confiding, simple-minded, and high-minded curate, is one of the most engaging persons that eighteenth-century literature has bequeathed to us, while the description of the inns and of the life of the road, again reminiscent of Cervantes, are vivid to the point of reality. The faculty of description was Fielding's, and if often we miss the intense emotional treatment or the sympathetic delineation of the spiritual element in man's activity, it is still good to listen to the exposition and to the comments of one whose common sense allowed no dimming of his perception, and whose manly nature and warm heart would not permit poverty, the animosity of enemies, or sickness to warp his judgment. His writings are, therefore, graphic and illuminative, and though they are not loftily inspiring because of their lack in finer sympathy, a pervading healthiness of tone and a sense of straightforward observation do much to atone for the broad speech that is so often unnecessarily their chief blemish. His own experience crops up unmistakably in his books, and Tom Jones has well been called 'Fielding in his youth,' as Captain Booth is 'the Fielding of later years.' The looseness of many of the scenes and the coarseness of much of the language of his novels are indicative, therefore, not alone of a lax society, but also of a life in which there was a good share of rioting and carousal. The final words of praise to be said of Fielding's novels are that they possess the unity of plot which differentiates them from such structureless work as that of Smollett, while the remarks and criticisms imbedded in them have much of the wisdom and the wit that one looks for and finds in Montaigne. It is the lack of opportunity in dramatic compositions for such personal running commentary and maxims that partially explains the comparative failure of Fielding as a playwright.

Fielding married in 1737. It did not take him long to use up his wife's fortune in extravagant living as a country squire, and so in 1740 the law was taken up as a means of livelihood. No success followed his legal studies, and the author went back to his pen and paper. *Jonathan Wild*, an ironical work, whose interest was chiefly for its own day, appeared in 1743. The same year saw the establishment of the *True Patriot*, a semi-political journal edited by Fielding, succeeded by the *Jacobite Journal* in 1745. The services of his journal to the Hanoverian cause resulted in the author's appointment to the position of justice of the peace in Middlesex, a reward due to the good offices of Lord Lyttleton, a lifelong friend. Until his death at Lisbon, in 1754, Fielding administered the duties of his position honestly and zealously, as all may learn who will take up his *Journal of a Voyage to Lisbon.* Nor is this hard to understand, for he had himself tasted the many flavors of the cup of life; and such men are the best judges, unless they have grown bitter with the bitterness that is never wholly absent from the draught.

Though Fielding died comparatively early, his career was eventful and his achievements lasting. Playwright, country squire, editor, novelist, man about town, stage manager, political pamphleteer, magistrate—all these parts he played, showing in them all the qualities which make it easy to understand the censure that has attended his life, but showing also those characteristics which justify the affection that all must feel for him whom Thackeray called 'the manly, the English, Harry Fielding.' Editions of Fielding's *Works* have been published by Scott and Roscoe (Edinburgh, 1840); by Browne (London, 1871); and by Gosse (New York, 1898). Consult: Lawrence, *Life and Times of Fielding* (London, 1855); Dobson, *Life*, in "English Men of Letters" series (ib., 1895); Lindner, *Henry Fielding's dramatische Werke* (Dresden, 1895). The Temple edition of Fielding's *Works*, edited by Saintsbury, appeared in 1902 (London and New York.)

FIELDING, Sarah (1710-68). An English novelist, sister of Henry Fielding (q.v.). She wrote *The Adventures of David Simple* (1744), which in order of time is the third English novel of manners, and to which her brother contributed a preface. She wrote also *The Governess* (1749), *Lives of Cleopatra and Octavia* (1757), and, with Miss Jane Collier, *The Cry: a Dramatic Fable* (1754).

FIELD KITCHEN. A military term denoting the place in camp where soldiers' rations are prepared. To what extent the kitchen will be furnished will depend on the permanency of the camp and the character of the undertaking or campaign. In the field the mess furniture of a United States soldier is limited to one tin cup, knife, fork, and spoon, and such device for individual cooking as may be furnished by the Ordnance Department. The kitchen may be furnished as described under Field Cooking, or the camp may be sufficiently permanent in character to admit of the employment of field ovens or stoves. See Field Cooking.

FIELD-LARK. (1) In the United States, the meadow-lark (q.v.). (2) In Great Britain, the skylark or the pipit (q.v.).

FIELD-MARSHAL. A military title of the highest rank in the armies of England, Germany, Austria, Russia, and Sweden. The rank is more nominal throughout Continental Europe than in Great Britain, it being occasionally bestowed by one nation on the ruler of another. In the year 1818 the Duke of Wellington was field-marshal in the armies of Austria, Prussia, and Russia. The rank was abolished in the French Army in 1848. A lieutenant field-marshal in Austria ranks as a general of division. The insignia of rank for a field-marshal is the baton. In England the pay of the field-marshal commander-in-chief is £5000 per annum. See Rank and Command.

FIELD-MOUSE. See Mouse and Vole.

FIELD OF BLOOD. (It. *Campo di Sangue*). A name given to the battlefield of Cannæ (q.v.).

FIELD OFFICER. A military title applied to all officers above the rank of captain or company officer, and under the rank of general officer. Commissioned officers may be divided into four general classes: General, staff, field, and regimental. The term *field* officer includes all officers qualified by rank to command a battalion or regiment. See Army Organization; Rank and Command.

FIELD OF FORCE. See Force; Magnetism; Dynamo-Electric Machinery; Electricity.

FIELD OF LIES, or Lügenfeld. The plain of Rothfeld, near Colmar in Alsace, where in June, 833, Louis the Pious (q.v.) was shamefully betrayed to his sons.

FIELD OF MARCH. See Champ de Mars.

FIELD OF MAY. See Champ de Mars.

FIELD OF THE CLOTH OF GOLD. The name given in English and French history to the place of meeting and interchange of civilities between Henry VIII. of England and Francis I. of France, from June 7 to June 24, 1520. The meeting occurred on a plain between Guisnes and Arde, in the present Department of Pas-de-Calais. The name originated in the gorgeous trappings and apparel of the participants and the splendor of the pageantry in the jousts and banquets which took place. Politically the meeting of the two kings was without result. Francis I. indeed sought the aid and friendship of the English King against Charles V. of Germany, and had proposed to raise the English favorite, Wolsey, to the Papacy if this result were accomplished. The meeting on the Field of the Cloth of Gold was followed by interviews between Charles V. and Henry VIII. at Gravelines and Calais, which more than offset the previous meeting of Henry with Francis. Shakespeare in *Henry VIII.*, Act i., Scene 1, has put into the mouth of the Duke of Norfolk a graphic account of the encounter on the Field of the Cloth of Gold. Consult: Brewer, *The Reign of Henry VIII.* (London, 1884); Ewald, *Studies Restudied* (London, 1885); Martin, *Histoire de France*, vol. vii. (Paris, 1856); Pardoe, *The Court and Reign of Francis I.* (London, 1887).

FIELD OF THE FORTY FOOTSTEPS. A name given to the fields formerly stretching behind Montagu House in London, from a tradition of a combat between two brothers, whose footsteps remained visible and were marked by total absence of vegetation. Southey says that he counted seventy-six footsteps about three inches deep.

FIELD OF VIEW. The space within which objects can be seen through an optical instrument; more strictly, the space within which the image of an object may be seen by whole pencils.

FIELD-PLOVER. In the United States, the local name of three different shore-birds: (1) the Bartramian sandpiper (*Bartramia longicauda*), frequently called 'upland plover,' though not a plover at all; (2) the golden plover; and (3) the black-bellied plover. See PLOVER; SANDPIPER.

FIELD-SPARROW. A small sparrow (*Spizella pusilla*), common through the northern half of the United States in summer and going south in winter. It closely resembles the chipping sparrow in size and color, except that where that species is ashy this is suffused with brownish. It nests on or near the ground in fields and meadows, lays spotted eggs, and has a slender, pretty song, as if in weak imitation of the song-sparrow.

FIELDS, JAMES THOMAS (1817-81). An American author and publisher. He was born in Portsmouth, N. H., and was educated in the public schools of that place. In 1834 he removed to Boston, and in 1839 he became junior partner in the publishing firm of Ticknor, Reed & Fields, in which he later became the controlling partner. His charming personal qualities, his sympathy, his liberality to all with whom he dealt, and his unquestionable literary judgment drew to him most of the best-known American authors of the time, and he became the publisher of Longfellow, Hawthorne, Emerson, Holmes, Whittier. and Lowell, besides introducing Tennyson and Browning to American readers even before their true worth was recognized in England. He edited the *Atlantic Monthly* from 1862 to 1870. The last ten years of his life were spent in authorship and lecturing. His own published works include: *Poems* (1849-54); *A Few Verses for a Few Friends* (1858); *Yesterdays with Authors* (1872); *Hawthorne* (1876); *In and Out of Doors with Charles Dickens* (1876); and *Underbrush*, a volume of essays. He also edited, with Edwin P. Whipple, a *Family Library of British Poetry* (1877). Consult: Annie Adams Fields (his wife), *Memoir of James T. Fields, by His Wife* (1881); also her *Authors and Friends* (1896).—ANNIE ADAMS (1834—), his wife, was born in Boston, Mass. Her publications include: *A Shelf of Old Books; Under the Olive* (1880), a collection of verse; *How to Help the Poor* (1883); *The Singing Shepherd, and Other Poems* (1895); *Authors and Friends* (1896); the *Life and Letters of Harriet Beecher Stowe* (1897); and *Orpheus, a Masque* (1900).

FIELD SPANIEL. See SPANIEL.

FIELD-SPORTS, or TRACK ATHLETICS. The various sports and competitions practiced in the open air (usually on a prepared track or course), and included under the general description of field-sports, are principally as follows:

One hundred yards dash	(100 yards dash)
Two hundred and twenty yards dash	(220 yards dash)
Three hundred yards dash	(300 yards dash)
Four hundred and forty yards dash	(440 yards dash)
Six hundred and sixty yards dash	(660 yards dash)
One-half mile run	(880 yards run)
One thousand yards run	(1000 yards run)
Running one, two, and five miles	(1, 2, and 5 miles)
One hundred and twenty yards hurdle	(120 yards hurdle)
Two hundred and twenty yards hurdle	(220 yards hurdle)
Sack racing	(on the flat)
Sack racing	(over hurdles)
One mile walk	(1760 yards walk)
Running broad jump.	
Running high jump.	
Pole vaulting	(for height)
Pole vaulting	(for distance)
Throwing the sixteen pound hammer	(16 lbs.)
Throwing the fifty-six pound weight	(56 lbs.)
Bicycling, from one-quarter to five miles	(440 yards—5 miles)

Other outdoor sports such as cricket, football, fox-hunting, golf, hurling, lacrosse, paper-chase, etc., will be found described under their proper titles.

In 1884 the title of *All-Around Athletic Championship of America* was instituted, the programme of which consists of ten events: the 100-yard dash, high jump, long jump, pole jump, throwing 16-pound hammer, putting 16-pound shot, throwing 56-pound weight, 120-yard hurdle race, half-mile walk, and one-mile run. The competitor scoring the highest percentage in the ten events wins the title of All-Around Champion. Competitons are held annually. The following measurements have been laid down as a fair average of what the proper dimensions of an all-around athlete should approximate:

HEIGHT		Weight	Chest	Waist	Hips	Thighs	Calf
ft.	ins.	lbs.	ins.	ins.	ins.	ins.	ins.
5	6	120	35	27	34	20	13½
5	8	140	37	28	35½	21	14
5	10	155	39	29	37	22	14½
6		168	40	31	38	23	15

See ATHLETICS.

FIELD WORKS. See FORTIFICATION.

FIERABRAS, fyå'rå'brå', or **FERUMBRAS.** A paladin of Charlemagne, whose name gave the title to various romances of the fourteenth and fifteenth centuries. One version appears in Caxton's *Lyf of the Noble and Christen Prynce, Charles the Grete* (1485). Fierabras carried away from Rome the crown of thorns, and the balsam with which the body of Christ was embalmed, and which possessed healing properties of the greatest efficacy.

FIERDING COURT or **THING** (Scotch *ferding*, farthing, fourth part, from AS. *féorþing*, *féorþling*, farthing, from *féorþing*, fourth). A district court of civil jurisdiction and of a popular character which existed among all the Germanic nations of western Europe before the establishment of the feudal system. There were four of these courts in every 'hundred,' and their jurisdiction extended to all causes where the matter in dispute did not exceed the sum of three marks, or forty shillings. There are no traces of this court in English history after the Conquest, but it probably survived in the court baron or manorial court of a later day. All of those local and popular tribunals in course of time gave way before the advance of the national organization for the administration of justice. See CURIA REGIS.

FIERI FACIAS (Lat., cause to be done). One of the most ancient writs known to English law, taking its name from two leading words in the mandatory clause of the instrument—*quod fieri facias de donis et catallis*—that you cause (satisfaction) to be made of the goods and chattels. It was issued for the purpose of enforcing a judgment for damages or cost. Originally, as the clause quoted above indicates, it was leviable only upon personal property. If a judgment creditor wished to levy upon real estate, he was obliged to take out the writ of elegit (q.v.). Both writs in most jurisdictions have been superseded by the execution (q.v.).

FIERY BOLE′TUS. See FUNGI, EDIBLE AND POISONOUS.

FIESCHI, fê-ĕs′kê, GIUSEPPE MARIA (1790-1836). A Corsican, notorious through his attempt on the life of King Louis Philippe. At first a shepherd, he later entered the Neapolitan Army under Murat, became a sergeant and a member of the Royal Bodyguard, and was given the cross of the Two Sicilies for bravery in the campaign of 1812-14. With shameless treachery he twice betrayed the cause of Murat to the Austrians. In 1816, having returned to Corsica, he was sent to prison for ten years for forgery, and served his time at Embrun. After leading the life of a vagabond for a year, Fieschi came to Paris at the time of the July Revolution, and was employed by the police in a minor capacity. The immediate cause of his plot was his dismissal by order of the prefect of the Seine. Disguising his purpose under the cloak of political enthusiasm, he leagued with himself one or two persons of republican enthusiasm, who hated the government of the citizen King. These were Morey, a saddler; Pepin, a grocer; and Victor Boireau, a maker of lamps. Fieschi sketched the plan of an infernal machine with twenty barrels that could be simultaneously discharged; had one made, and placed it in a house on the Boulevard du Temple. The review of the National Guard held there, July 28, 1835, afforded him the opportunity he desired. On the approach of the King and Queen he fired his machine. Eighteen people were killed, among whom was Marshal Mortier, who fell dead beside his sovereign. Louis Philippe, however, escaped with a mere scratch, and was able to continue the review. The assassin was immediately seized, and, with his accomplices, was tried, condemned, and executed, February 16, 1836. Consult: *Procès de Fieschi et de ses accomplices, devant la cour des Pairs* (Paris, 1836), containing a biography of Fieschi; Blanc, *Histoire de dix ans* (Paris, 1842; Eng. trans., London, 1844-45); Du Camp, *Les ancêtres de la Commune: l'attentat Fieschi* (Paris, 1877); Thornbury, *Old Stories* (London, 1870).

FIESCO, fê-ĕs′kô. A tragedy by Schiller (1783), and the name of its chief character.

FIESCO, or **FIESCHI,** fê-ĕs′kê, GIOVANNI LUIGI, Count of Lavagna (c. 1523-47). The head of a conspiracy against Andrea Doria. He was born about 1523, and was a member of one of the oldest and most illustrious houses of Genoa. In organizing and planning his famous plot he seems to have been actuated by motives both of patriotism and class feeling. Andrea Doria, the famous admiral, sprung from a race hereditarily at feud with the Fieschi, having expelled the forces of Francis I. from the State, had made himself practically dictator at Genoa, and held the office of doge, while his nephew, Gianettino, commanded the galleys. Count Fiesco organized a plot, having for its object the death of Doria and Gianettino, whom the admiral had designated as his successor in power, and the establishment of an oligarchic form of government. He speedily enrolled a formidable array of accomplices, his three brothers among the foremost, and entered into secret negotiations with France and Rome and the Duke of Parma. Doria, in spite of repeated warnings, refused to ascribe treacherous or subversive designs to Fiesco, whom he regarded as a friend and partisan, and an alliance by marriage was even arranged between the families. Complete success seemed at first to crown the conspirators. When the attack was finally made, January 2, 1547, the gates of the city were forced, the fleet was captured, Gianettino was assassinated, and Doria put to flight. The Count had but to appear and dictate; but he was nowhere to be found. It was finally discovered that in stepping from one galley to the other in the darkness of night, he had stumbled, and, falling overboard, was borne down by his ponderous armor and drowned in the harbor. This put an end to the conspiracy. Doria returned in triumph, and those of the Fieschi who were not slain were banished forever from Genoa. Schiller founded a tragedy on this dramatic event. Consult: Mascardi, *Historical Relation of the Conspiracy of the Count of Fieschi*, translated by Hare (Edinburgh, 1886); Retz, *La conjuration du comte de Fiesque* (Paris, 1884); Brea, *Sulla congiura de conte G. L. Fieschi* (Genoa, 1863); Sismondi, *History of the Italian Republics* (Eng. trans., New York, 1870).

FIESOLE, fyā′zô-lâ (Lat. *Fæsulæ*). One of the ancient Etruscan cities. It is situated on the crest of a hill, about three miles from Florence. The heights of Fiesole command a remarkably beautiful view of Florence and the surrounding hills. In B.C. 225 Fiesole was the scene of a Roman defeat by the Gauls; here also Hannibal encamped after crossing the Apennines. The city was sacked by Sulla, who afterwards dispatched thither a military colony, which was chosen by Catiline as his headquarters. During the Gothic rule in Italy, Fiesole was so strongly fortfied and garrisoned as to endure a long siege by Belisarius. The growth of Florence during the Middle Ages gradually reduced it to insignificance. It is now a place of about 2000 inhabitants. The only vestige of Etruscan structures still remaining is the cyclopean city wall, constructed of huge blocks of stone, many portions of which are wonderfully perfect. The site of the Etruscan fortress is now occupied by a convent, and interesting fragments of the foundations have been brought to light. To the Roman period belong the ancient theatre and some ruins of baths. The Church of Saint Alexander contains fifteen ancient columns, and probably occupies the site of a Roman temple.

FIESOLE, FRA GIOVANNI DA. See ANGELICO, FRA.

FIESOLE, MINO DA. See MINO DA FIESOLE.

FIÉVÉE, fyâ′vâ′, JOSEPH (1767-1839). A French publicist and novelist, born in Paris. His *Sur la nécessité d'une religion* (1795), as well as many cutting epigrams, made him unpoplar with the Directory, and he thought it prudent to withdraw to the country, where he spent his leisure in writing two clever novels, *La dot de Suzette* (1798) and *Frédéric* (1799).

The advent of Napoleon to power brought Fiévée to Paris, where he became a loyal chronicler of the Consulate and the Empire. He at first supported the Restoration with equal ardor, but subsequently joined the opposition.

FIFE (Fr. *fifre,* It. *piffero, pifara,* from OHG. *pfīfa,* Ger. *Pfeiffe,* pipe, from ML. *pipa,* pipe, from Lat. *pipare,* to pipe, from onomatopoetic Gk. *πιπάζειν* *pipazein,* to chirp). An ancient wind-instrument with six holes. It differs from the piccolo in that it has no keys. Its compass is two octaves from d^1 to d^3. The fife is pitched in various keys, the most common being F and B♭. The fife figures in the sculptured memorials of the Argonautic Expedition, and from that time to this has maintained its place as a simple yet effective instrument for martial purposes. It was common with English troops till the reign of James I., but was then discontinued, to be reintroduced by the Duke of Cumberland at the siege of Maestricht in 1747. With the drum it still constitutes the field music of all guards, infantry regiments, and of every regiment of line infantry except rifle, light infantry, or Scottish regiments. During the Civil War in the United States it was much used in both armies, but has since given way to the more modern military band. It is still retained, however, by many regiments of the various State National Guards.

FIFE. See Fifeshire.

FIFE, Alexander William George Duff, first Duke of, and Marquis of Macduff (1849—). A British peer. He was educated at Eton, and succeeded his father as the sixth Earl of Fife in 1879. From 1874 to 1879 he sat in Parliament as a Liberal member from Elgin and Nairn. From 1889 to 1898 he was vice-president of the British South Africa Company. In 1889 he married Princess Louise Victoria Alexandra Dagmar, the eldest daughter of Edward VII., then Prince of Wales, on which occasion he was created Duke of Fife.

FIFE′NESS. A low headland, the easternmost point of Fifeshire, Scotland, lying on the north side of the Firth of Forth (Map: Scotland, E 3). To the north in the sea are the dangerous Carr rocks, with an iron beacon 35 feet high, which required six years to construct. Fifeness is in view of the Isle of May and Bell Rock lights. There still remain traces of a wall, built by the Danes in the latter part of the ninth century.

FIFE RAIL. See Belay.

FIFE′SHIRE. A maritime county of the eastern midland division of Scotland, between the Firth of Forth on the south and the Firth of Tay on the north (Map: Scotland, E 3). Area 492 square miles; coast-line, 85 miles, mostly rocky and having many small ports. The surface is a succession of cultivated vales and hills, agriculture being in an advanced state. There are many coal and iron mines and lime-quarries. Linen, floor-cloth, and malt liquors constitute the leading manufactures. Population, in 1801, 93,750; in 1851, 153,550; in 1901, 218,850. Capital, Cupar.

FIFTH (in music). See Interval.

FIFTH MONARCHY MEN. An English sect of millenarians which appeared during the Puritan Revolution. It expressed belief in the literal interpretation of Daniel's prophecy that the four great monarchies of Antichrist—Assyria, Persia, Greece, and Rome—were to be succeeded by a fifth monarchy—the reign of Christ on earth for a thousand years. They differed from other Second Adventists in considering it a duty to assist the establishment of the new kingdom by force. In the expectation that the Commonwealth was the commencement of the new era, they joined Cromwell's army in large numbers. The march of events was, however, not sufficiently swift to please them; and in 1657, on the discovery of a plot to murder the Protector and to revolutionize the government, their leaders, Venner, Grey, Hopkins, and others, were arrested and kept imprisoned until after Cromwell's death. After the Restoration on January 6, 1661, Venner, who was a wine-cooper, led fifty associates in an attempt to take possession of London in the name of King Jesus. Those who were not killed were taken prisoners, and Venner and ten others were hanged for treason. Consult: Masson, *Life of Milton,* vol. iii. (Cambridge, 1859-94); Gardiner, *Commonwealth and Protectorate* (London, 1894-1901); Neal, *Puritans* (Portsmouth, 1816-17); and Carlyle, *Cromwell's Letters and Speeches* (London, 1845).

FIG (AS. *fīc,* OFr. *figue, fige,* from Lat. *ficus,* fig). A name given to a large group of plants very diverse in habits of growth and in products useful to man. The fig of commerce, known botanically as *Ficus carica,* is a diœcious plant, 15 to 30 feet high, with rough, deep-lobed leaves, belonging to the Artocarpeæ or breadfruit family. This plant, so far as known, is a native of Asia from Syria to Caucasus and Kurdistan. Like the date, it is an inhabitant of tropical and subtropical countries, and because it often bears three crops of edible fruit in a season, it was one of the chief reliances of the peoples inhabiting its native country previous to the time when cereal grains were introduced into general cultivation. Besides being edible in a fresh state the fig can be canned, preserved, or dried, in which conditions it is sold as a commercial article. Its chief importance, however, is as a dried fruit, thousands of tons being annually consumed in the United States and England alone. Found wild in the earliest inhabited countries, the fig has accompanied man in all his wanderings wherever a suitable climate has permitted its introduction. It was common in Greece during the time of Plato; was early carried into Italy, and thence to Spain and Gaul. It was introduced into England prior to 1257, and has since maintained a more or less precarious existence as a standard in the south of England to this day. It is most successful when trained on walls and given winter protection. In such situations it bears well, and is remunerative where there is a suitable market for the fresh product. As a greenhouse plant the fig is common everywhere outside the range of successful outdoor culture.

In the United States, the fig has long been in cultivation in the Gulf States, and even as far north as North Carolina, while in California it finds its most congenial conditions; it is here too that the closing years of the nineteenth century witnessed the successful establishment of caprification, as a result of which the production of Smyrna figs in California may be accepted as an established enterprise. Caprification is the name given to the operation commonly practiced by the natives of fig-growing countries. It consists in the tying of branches of the wild fig, or caprifig, in the tops of the cultivated trees. The caprifig, which is found wild in southern Europe, northern Africa, and western Asia, now cultivated in California, is the only fig bearing staminate flowers. It is, therefore, absolutely necessary that this variety be planted near cultivated sorts from which mature seeds are desired. Because of the peculiar structure of the fig fruit, the flowers being borne, as it were, on the inside of the receptacle, the process of pollination cannot be accomplished either by the wind or by ordinary insects. A peculiar hymenopterous insect, called Blastophaga, is an inhabitant of these wild figs in their native country and also visits the cultivated varieties; it is to them alone that the pollination of the cultivated sorts is due. Smyrna fig culture would be an impossibility without this insect. Until this fact was known all attempts at cultivating this fig outside of Smyrna were failures. Now, however, these figs can be quite as successfully grown in California as in the native country. As the Smyrna fig produces only pistillate flowers, without pollination, the fruits attain only partial development, no seeds are formed, and the delicate flavor which constitutes the chief value of the Smyrna fruits cannot be secured.

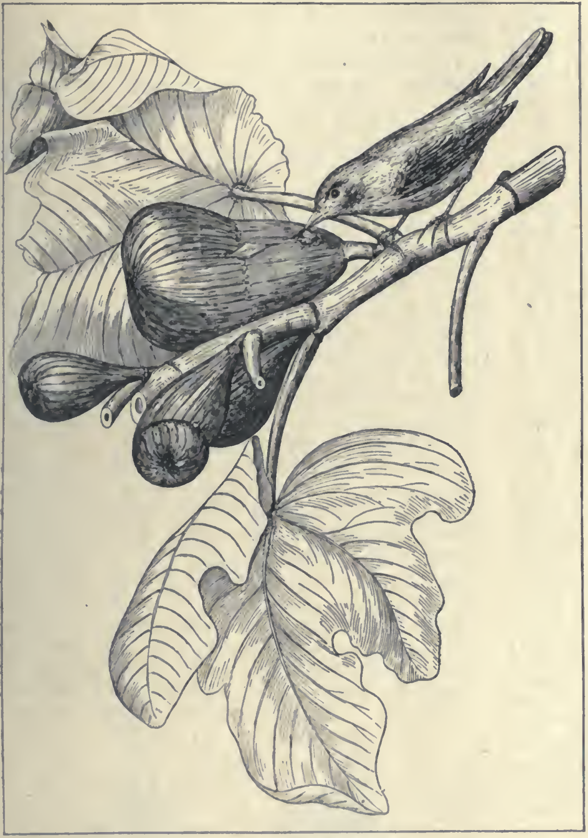


FIG AND FIGPECKER.

A typical Italian cultivated fig ('fetifero') and the fig-pecking bird, the 'beccafico' (q.v.).

Besides the caprifig (*Ficus carica*, var. *sylvestris*) and the Smyrna fig (*Ficus carica*, var. *Smyrnica*) there are numerous other sorts more or less commonly grown, which attain perfection without the aid of pollen of the caprifig. These are roughly grouped under the name common edible figs, and known botanically as *Ficus carica*, var. *hortensis*. They bear two crops annually, the early figs, or 'brebas,' and the late or 'summer figs.' Another peculiar group known as the San Pedro figs (*Ficus carica*, var. *intermedia*), some of which are grown in California and in Florida and other Southern States, mature only one crop of fruit, the 'brebas'; the second crop always falling before reaching maturity. This is explained by the fact that the first fruits contain only so-called gall or mule flowers, like the common edible fig, while the fruits of the second crop contain only pistillate flowers, like those of the true Smyrna fig, and, as there is no pollen to fertilize them, they fall.

The fig is easily propagated either by budding, grafting, cuttings, or layers. In general, however, cuttings serve the purpose best. They are best made from the ripened wood of the previous season's growth. If the cuttings be made in December or January, in California, the young plants will be ready for the orchard a year later. As the fig is not a hardy plant, its cultivation as a standard is limited. On the Atlantic seaboard it is confined to States south of Virginia, and in the West to California, where the most extensive orchards of America exist. The tree is long-lived, comes into bearing early, and consequently requires a free space in which to ripen its fruit; it is, therefore, frequently planted as an avenue or border tree. In the orchard it should be given forty feet each way; and if grown with other plants these must be removed before crowding occurs.

All the dried figs grown in America are produced in California; outside this region the copious rains have a detrimental effect upon the fruits, rendering them unfit for the purpose. The dried-fig output of California is steadily increasing. In 1886 the total output was estimated at 100,000 pounds. In the five years ending with 1899 it was 14,945,000 pounds, or an average of nearly 3,000,000 pounds annually. In a fresh state for table use the fig can be transported only a short distance. Fig-culture in greenhouses for furnishing fresh table fruits, outside of the areas where the fig thrives in the open, will doubtless long continue.

For a discussion of varieties suited for these various purposes, consult: Bailey, *Cyclopedia of American Horticulture* (New York, 1900); "The Fig," *California Board of Horticulture* (Sacramento, 1890); "The Fig," *United States Department of Agriculture, Division Pomology, Bulletin 9* (Washington, 1901).

Fossil Fig. The fig and its allies are represented by numerous fossil remains, consisting almost entirely, however, of the leaves. The genus Ficus itself appears first in the Lower Cretaceous rocks, and it has been recognized in the Cretaceous deposits of Greenland, of Moravia, and in those of Kansas and Nebraska in the United States. Numerous species have been found in the Tertiary rocks, especially in the Eocene and Miocene deposits of Europe and North America. Few fossil remains of the genus Ficus have been found in the rocks of those regions where the fig now grows in its native condition. Consult Solms-Laubach, *Herkunft, Verbreitung, Domestication der gewöhnlichen Feigenbäume* (Göttingen, 1882).

FIGARO, fē′gȧ′rō′. (1) A famous dramatic character, central figure in Beaumarchais's comedies *Le barbier de Séville* and *Le mariage de Figaro*, a clever, witty, nonchalant rogue. Mozart made an opera of *The Marriage of Figaro;* Paisiello, and afterwards Rossini, of *The Barber of Seville.* (2) In 1826 the name 'Figaro' was chosen for a Parisian journal, since famous, that counted among its contributors George Sand, Jules Sandeau, Alphonse Karr, Jules Janin, and other men of literary mark. It suspended in 1833, to be revived in even greater brilliancy in 1854 by its great editor, Villemessant (q.v.), whose *Mémoires* (1867) are a most valuable contribution to the history of French journalism. See Mariage de Figaro; Nozze di Figaro.

FIGEAC, fē′zhȧk′ (Lat. *Figiacum*). The capital of an arrondissement in the Department of Lot, France, situated in a wooded valley on the right bank of the Selle, 32 miles east-northeast of Cahors (Map: France, J 7). It is irregularly built, but contains some interesting ancient buildings, including the churches of Saint Sauveur and Notre Dame du Puy, dating from the twelfth and fourteenth centuries. There is a fine obelisk to the memory of J. J. Champolion-Figeac, who was a native of the town. It has some cotton manufactures, and a trade in wine and cattle. Population of the commune, in 1901, 5861. The town arose around a Benedictine monastery founded in 755. It was captured by the Huguenots in 1576, and was one of their strongholds.

FIG-EATER, or **JUNE-BEETLE**. An injurious beetle of the genus Allorhina, especially *Allorhina nitida*, of the Southern United States. It is green and brown in metallic hues, rendering it nearly as beautiful as the tropical beetles used as ornaments. It takes its name from doing some injury to figs, as well as to certain other plants. Several other beetles, some scale-insects, etc., are also pernicious to this fruit. See June-Beetle.

FIG FOR MO′MUS, A. A volume of poetical satires by Lodge (1595), dedicated to the Earl of Derby.

FIGHTING-FISH. A small climbing-perch (*Ctenops pugnax*) of southeastern Asia, and particularly of Siam, where it is very commonly kept captive for the amusement of its owners by its pugnacity. Two of these creatures when brought together often rush immediately to combat, or one will attack its own image in a mirror. Fish-fights are a favorite amusement of the Siamese; the license to exhibit them yields a considerable annual revenue; and an extraordinary amount of gambling takes place in connection with them. The fighting-fish has the anal and dorsal fins prolonged into tapering points. When the fish is quiet, its colors are dull; but when it is excited, they glow with metallic splendor, and the projected gill-membrane waves like a black frill around the throat.

FIGHTING JOE HOOKER. A nickname given to General Joseph Hooker (q.v.).

FIGHTING PARSON, The. A nickname given to W. G. Brownlow (q.v.).

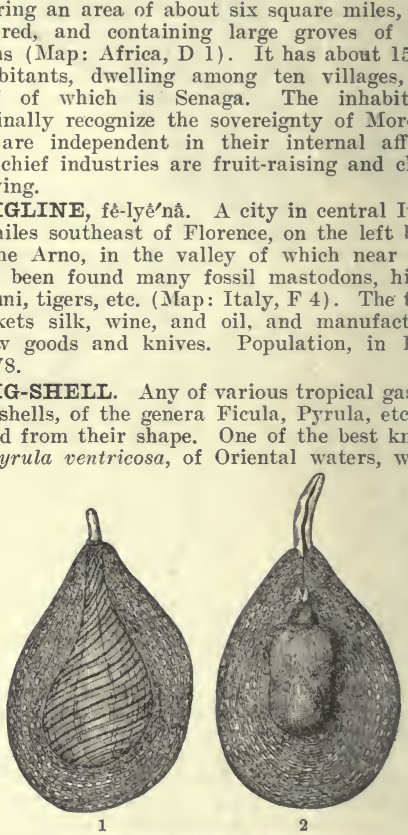
FIGHTING PRELATE, The. A name given to Henry Spenser, Bishop of Norwich, who fought against the insurgents in the rebellion of Wat Tiler, and later led an army into Flanders.

FIGHTING TÉMÉRAIRE, tā′mā′râr′, The. See Téméraire.

FIGIG, fē-gēg′. An oasis in the northern part of Africa, near the eastern boundary of Morocco, covering an area of about six square miles, well watered, and containing large groves of date palms (Map: Africa, D 1). It has about 15,000 inhabitants, dwelling among ten villages, the chief of which is Senaga. The inhabitants nominally recognize the sovereignty of Morocco, but are independent in their internal affairs. The chief industries are fruit-raising and cloth-weaving.

FIGLINE, fē-lyā′nȧ. A city in central Italy, 25 miles southeast of Florence, on the left bank of the Arno, in the valley of which near here have been found many fossil mastodons, hippopotami, tigers, etc. (Map: Italy, F 4). The town markets silk, wine, and oil, and manufactures straw goods and knives. Population, in 1901, 11,478.

FIG-SHELL. Any of various tropical gastropod shells, of the genera Ficula, Pyrula, etc., so called from their shape. One of the best known is *Pyrula ventricosa*, of Oriental waters, which has a very extensive foot, like its relatives the tun-shells (q.v.), and the mantle large-lobed, reflexed upon the shell and profusely spotted. The shell is pear-shaped, has a long siphon-canal, and the surface is transversely ridged. Several other species belong to the genus, which goes back to the Chalk and Tertiary periods.



A FIG-SHELL (PYRULA VENTRICOSA).

1. Dorsal view of the shell and expanded muscular parts. 2. Ventral view, showing the extended siphon, head, with two short tentacles, and the oblong creeping muscle or 'foot.'

FIGUEIRA, fē-gā′ē-rȧ. A seaport town in the District of Coimbra, Portugal, situated at the mouth of the Mondego River, about 25 miles west by south of Coimbra. It is connected by rail with Lisbon and Oporto. The harbor is small and obstructed by a bar, but the town has considerable trade in salt, wine, fruit, and oil. Figueira is much visited for its bathing. Population, in 1890, 5676; in 1900, 7890.

FIGUERAS, fē-gā′rȧs. A town in the Province of Gerona, Spain, situated in the centre of the Ampurdán, 14 miles from the French frontier, and 21 miles north-northeast of Gerona (Map: Spain, G 2). On a height (480 feet) near the town is the pentagonal citadel of San Fernando, one of the strongest fortresses of Spain, and the key of the Pyrenees. It was constructed in the latter half of the eighteenth century, and admits a garrison of 16,000 men. This fortress has been so frequently taken by the French as to give rise to the common saying that in time of peace it belongs to Spain, but in time of war to France, having been captured by the latter in 1794, 1808, 1811, and 1823. The fertile plane of Ampurdán produces oil, fruit, grain, and wine, and the town has manufactures of soap, leather, liquors, alcohol, etc. It contains a secondary college, a civil and military hospital, and an asylum for the aged. In the parish church here Philip V. married Maria Louise of Savoy in 1711. The antiquity of Figueras has been proved by the discovery of a Latin inscription dating before the Christian era. Population, in 1900, 11,084.

FIGUERAS Y MORACAS, ē mō-rä′kȧs, Estanislao (1819-82). A Spanish statesman. He was born at Barcelona, studied law at Madrid, entered politics, and became active in the Republican ranks. He was elected to the Cortes from Barcelona in 1851, and became the principal spokesman of his party. He was exiled in 1867 for complicity in a plot against Narvaez, but returned after a few months. After the Revolution of 1868 and the expulsion of Queen Isabella, he joined with Castelar, Salmeron, and Pi y Margall in actively opposing the reëstablishment of the monarchy, and in 1870, when, in spite of their efforts, Amadeus of Savoy became King, Figueras continued to oppose him. Upon the abdication of the King in 1873, and the establishment of the Republic, Figueras was made president of the Provisional Council of Ministers, a position which he held until the Constituent Cortes established a new Cabinet. Figueras remained in the Cortes, a strong supporter of the Republic, until the restoration of the monarchy, December, 1874, when he retired to private life.

FIGUEROA, fē′gȧ-rō′ȧ, Francisco de (c.1540-1620). A Spanish lyric poet, a contemporary and fellow-townsman of Cervantes, having been born at Alcalá de Henares. Little is known of him, beyond the fact that he served for a time in a Spanish regiment in Italy; that he studied at Rome and Bologna; that soon after his return to Alcalá he made an advantageous marriage; and having won the favor of Don Carlos of Aragon, accompanied him to Flanders in 1579. Shortly before his death Figueroa gave orders that all his poems should be burned. Those that escaped were afterwards collected and edited by Tribaldos de Toledo, to whom we owe these scanty details of his life. They include sonnets, canzoni, elegies, and an eclogue, *Tirsi*, the name by which the poet himself was introduced by Cervantes in his pastoral *Galatea*. Figueroa was a disciple of Boscan and Garcilaso, both of whom he surpassed in his mastery of blank verse. His best-known sonnet is that written upon the death of Garcilaso's son. A selection of his poems is given in the *Biblioteca de Autores Españoles*, vol. xlii.

FIGUEROLA, fē′gȧ-rō′lȧ, Laureano (1816 —). A Spanish political economist, born at Calaf. He became professor of political economy in the University of Barcelona, and subsequently of commercial law at Madrid. From 1868 to 1870 he was Minister of Finance, and did much to improve the wretched condition of the Spanish treasury. He published *Estadistica de Barcelona* (1849-54).

FIGUIER, fē′gyȧ′, Guillaume Louis (1819-94). A French chemist and popularizer of science. He was professor of chemistry at Montpellier and in Paris, and carried out important original investigations. Later he devoted his time chiefly to the popularization of science. He became scientific editor of *La Presse* and afterwards of *La France*. His works and contributions to scientific journals are numerous. Among the most important are: *Exposition et histoire des principales découvertes scientifiques modernes* (6th ed. 1862); *Histoire du merveilleux dans les temps modernes* (1859-62); *L'alchimie et les alchimistes* (3d ed. 1860); and *Vies des savants illustres depuis l'antiquité jusqu'au XIXème siècle. The Human Race; The Insect World; The World Before the Deluge*, are the titles of the English translations of several of his popular works.

FIGULENE. See Potter's Clay.

FIGURATE NUMBER. See Number.

FIGURE, or **FORM** (Lat. *figura*, from *fingere*, to fashion, to feign; connected with Gk. *θιγγάνειν*, *thinganein*, to touch, Skt. *dih*, to smear, Goth. *deigan*, to knead, OHG. *teic*, Ger. *Teig*, Icel. *deig*, AS. *dāh*, Eng. *dough*), Perception of. The spatial attribute extension (q.v.) is ascribed only to certain classes of sensations, the visual and tactual; spatial relations, on the contrary, are predicable of all sensations alike, since all are localizable. Form, or figure, as used in psychology, is defined (Kuelpe) as "the general term comprehending all the spatial characteristics that can be *attributively* predicated of an impression." The perception of the figure of an object may then be regarded as the perception of a sum of extensions, and the problems involved are limited in their application to those sense departments to which extent may be assigned.

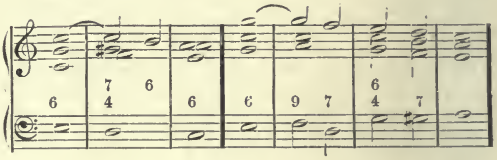
The cutaneous perception of figure has received but little investigation. By allowing the judgment to be made in visual terms, and by working with the 'procedure with knowledge' (see Psychophysics), Major was able to determine the limen of form at various parts of the skin. The forms, angles, open and filled circles, and filled triangles, were applied to the tip of the tongue, the lips, and the tip of the middle finger, and were gradually increased in size until the observer cognized the form. The results showed that the open circle was most easily cognized; and that the capacity of the surfaces for cognition of the forms was, in order of excellence, tip of tongue, tip of finger, lips. On the tip of the finger, the following liminal values were obtained: Angle with sides 4.6 mm., open circle 3 mm. in diameter, filled circle 5 mm. in diameter, filled equilateral triangle with sides 4.3 mm. in length. The largest stimuli used: angle 10 mm., open circle 11 mm., filled circle 12 mm., and triangle 9 mm., were too small to be cognized on the forehead, cheek, ball of thumb, and volar side of the wrist. This dependency of the form-limen upon the place stimulated is illustrated by the simple experiment of drawing a pair of dividers along the arm from the elbow to the finger-tips, or from the lobe of one ear to the lobe of the other, across the face. The objectively parallel lines seem to diverge toward the wrist, and as they pass the lips. The cutaneous limen for form is susceptible of marked decrease through practice, as is well shown in the ability of the blind to read by touch from raised letters or from raised points of varied number and arrangement.

The visual perception of figure may, like the perception of simple extension, be obtained by the resting eye in monocular vision, but for its full development binocular vision is essential. The visual perception of figure furthermore involves not only the perception of surface, but the perception of depth, or the apprehension of extension in the third dimension. One problem of the perception of surface consists in reconciling the fact that the field of vision presents a continuous surface with the fact that the sensitive parts of the retina, the rods and cones, form a mosaic of discrete points separated by non-sensitive areas. (The diameter of a retinal cone is estimated at 0.0015-0.0044 mm., and the distance from the centre of one cone to the centres of adjacent cones at 0.0040 mm.) While explanations have been made in terms of binocular vision, of eye-movement, and of our *a priori* bias toward continuity. Kuelpe asserts that there is no real problem here at all. See also BLIND SPOT.

Of special importance to the perception of the third dimension of figures are those optical phenomena known as the prevalence and rivalry of contours. When we observe the form of an object, the images which are cast upon the retinas of the two eyes differ slightly, owing to the difference in the position from which the two eyes view the object. If now these two images completely fused, the principal factor in the perception of depth would be removed; if, on the other hand, the two images remained obstinately disparate, it would be impossible to refer them to a single external object. It is the 'prevalence' and 'rivalry' of contours which "prevent the fusion of the two retinal images, and secure to each a certain amount of independence" (Hering); although "the impressions of the two eyes always fuse to a single idea" (Wundt). The contour phenomena are easily demonstrable with the aid of the stereoscope. If, e.g. the right eye be stimulated by a uniform surface of white, and the left eye by a black letter A upon a white background, there is afforded a pure instance of the prevalence of contour. The A is not made grayish, not washed over by the white of the right monocular field, but is seen in perfect clearness in the resultant single field; its contour suppresses or prevails over the surface presented by the white field. If each retinal field contains contours, and these contours possess little congruence, the phenomenon of 'rivalry of contours' is observed. Thus, if the letter U were presented to the left eye, and W to the right, or a vertical black band to the left eye, and a horizontal black band to the right, there would be no fusion of the two images, nor would either image permanently prevail over the other; but there will be a constant rivalry and alternation of the two fields.

The visual perception of form plays an important part in the production of what are known as the "elementary æsthetic feelings." (See ÆSTHETICS, EXPERIMENTAL.) Finally, the perception of figure is extremely subject to illusion; small angles are overestimated, the height of a square is overestimated, etc. (See ILLUSIONS, OPTICAL.) Consult: Titchener, *Experimental Psychology* (New York, 1901); Wundt, *Human and Animal Psychology* (Eng. trans. London, 1896); Kuelpe, *Outlines of Psychology* (London, 1895).

FIGURED BASS, or THOROUGHBASS. A system of musical notation in which words are denoted by placing figures over the bass note. It was first used in Italy during the latter part of the sixteenth century. The original object was to furnish the organist with a simple means of recognizing at a glance the necessary harmonic foundations in large choral or instrumental works. (The arrangement of the different parts in a score (q.v.) was not known then.) Playing from figured bass was a great art, because this system of notation indicates only the chord or its inversions, but nothing as to the leading of the various voices. To-day the art is not called for. as modern scores are written out in detail, and the figured bass in scores of the older masters (Bach, Handel) has been written out by eminent masters. (See FRANZ.) Figured bass plays an important part in the study of harmony, as all exercises are written in figured bass notation. Only the bass note is written. If no figure appears above the note, the ordinary triad is meant; the figure 6 denotes the first, $\frac{6}{4}$ the second inversion. The dominant seventh is expressed by 7; its inversions by $\frac{6}{5}$, $\frac{4}{3}$, 2 respectively. Suspensions are expressed by two figures, the first indicating the dissonance, the second its resolution. The interval of the third is not written out unless chromatically altered. Chromatic alterations are denoted by the usual signs placed before or after the figure 3♯, 5♭, 6♮. Sharps are also indicated by a line through the figure, 6̸. In figured bass all intervals are counted from the bass note, not the fundamental (q. v.). For further information or complete exposition of the theory of figured bass, consult Richter, *Manual of Harmony*, translated by Morgan (London, 1880).



FIGUREHEAD. A figure, or image, either a head, or bust, or full length, usually carved from wood, but in some recent vessels of hollow-cast bronze, carried at the prow or stem of ships. Its form is frequently dependent upon the name of the ship; the United States ship *Delaware* had the head of an Indian, supposedly of the Delaware tribe; the *Macedonian* had the bust of a Macedonian warrior, etc. The custom of placing figureheads on vessels of war is very ancient; the Phœnicians, Egyptians, Greeks, Romans, and

Northmen all placed images of their deities or of other persons, or animals, or objects upon the prows of their war galleys. The change from sail to steam, the removal of the bowsprit and substitution of the straight stem, has caused the old types of figurehead, scroll-head, billet-head, fiddle-head, etc., to disappear. In most modern ships the ornamentation is placed on each side of the upper plating near the stem, and consists usually of the national coats of arms in gilt and colors accompanied by gilt scrollwork. The United States steamship *Cincinnati* carries a handsome bronze figurehead which stands nearly vertical resting against the stem.

FIGURES OF SPEECH. The general term under which are comprised all deviations in the use of words from the literal sense, or from the literary or common forms and constructions. Such deviations have at different periods been variously classified and minutely differentiated. At the present time the tendency is toward greater generalization. The deviations from common use may be classified as figures of thought (figures of rhetoric) and grammatical figures (figures of etymology and figures of syntax). The individual figures are treated under ETYMOLOGY, FIGURES OF; SYNTAX, FIGURES OF; and RHETORIC, FIGURES OF. In addition to these classes, older authorities recognized a fourth, figures of orthography, the subclasses of which were called mimesis and archaism, mimesis representing the imitation in spelling of illiterate or provincial speech, as in the modern dialect stories; and archaism, the reproduction of antiquated orthography and form. The FIGURES OF ETYMOLOGY, concerned entirely with the forms of words, are employed chiefly for their effect on rhythm and poetry. The omission of an initial letter (aphæresis), as *'gainst* for *against*, or of a letter within a word (syncope), as *ne'er* for *never*, or the separation of parts of a compound (tmesis), as *how* good *soever*, have almost no application to common speech or prose writing. The FIGURES OF SYNTAX, or deviations in the construction, on the other hand, are in constant and unconscious use by speakers of all classes and ages. Their use adds directness, picturesqueness, and force to language. Of the figures of syntax, ellipsis is the most common, and appears in exclamations, commands, and energetic utterances of many kinds. It consists in the omission of a word, phrase, or clause theoretically essential, the absence of which, however, heightens the effect of the words. Thus *Here!* is more striking than *Come here*. *Bread*, may be equivalent to *Give me some bread;* and in many business forms and in signs a word or two may have the value of a whole sentence, as *No smoking*, for *Smoking is not permitted*. Emphasis is gained by the figure called redundancy (the use of unnecessary words to express an idea); e.g. I did it *my own self*. The FIGURES OF RHETORIC, or deviations from the usual application of words, add grace and beauty to the expression of thought, and increase the resources of speech. Therefore they appear constantly in poetical composition, and are frequent in prose and ordinary conversation. Simile requires a connective, pointing out the comparison: He is *as* brave *as* a lion; metaphor omits it: He *is* a lion. Such expressions as *roof* for *house* (synecdoche), or *gray hairs* for *old age* (metonymy), are figures in very common use founded on contiguity; and all the figures may be referred to the conscious or unconscious tendency toward enlarging the boundaries of language and heightening the emphasis of speech.

FIGURES OF A SYLLOGISM. Classes of the traditional categorical syllogism (q.v.) obtained by dividing syllogisms according to the position of the major, middle, and minor terms. (See MAJOR.) Designating these terms respectively by the conventional symbols P, M, and S, we have these four classes of figures represented by the following formulæ:

	I	II	III	IV
Major premise,	M P	P M	M P	P M
Minor premise	S M	S M	M S	M S
Conclusion	S P	S P	S P	S P

FIGWORT FAMILY. See SCROPHULARIACEÆ.

FIJI (fē′jê) or **VITI** (vē′tê) **ISLANDS.** A group of islands and a Crown colony of Great Britain, in the Southern Pacific, between latitudes 16° and 20° S., and between longitudes 177° E. and 178° W. (Map: Australasia, K 4). It is the largest and most valuable group in Polynesia. It consists of about 250 islands, of which about one-third are inhabited and among which the most important are: Viti Levu, 4527 square miles (about the size of Jamaica); Vanua Levu, 2499; Taviuni, 217; and Kandavu, 215 square miles. The total area, including the island of Rotuma, lying north of the group and added thereto in 1880, is estimated at 8045 square miles. The larger islands have, as a rule, a mountainous surface, with elevations 4000 feet above the sea. The islands on the south and southwest side of the group are clothed with dense forests, containing many valuable woods. The coasts are surrounded by coral reefs, and form many good harbors. The islands are very fertile and well provided with rivers, a number of which are navigable. In spite of their tropical situation, the Fiji Islands have a comparatively cool climate. The temperature seldom rises above 90° or falls below 60°. The rainfall is abundant, although unequally distributed. Owing to their sanitary precautions, Europeans enjoy almost complete immunity from the diseases common to the natives and the Indian coolies. The flora of the islands is exceedingly rich. The principal native plants are yams, cocoanuts, bananas, breadfruit, and sugar-cane. The chief occupation is agriculture. The sugar and cocoanut industries lead, about 50,000 acres being in these two crops. The former is controlled by the Colonial Sugar Refining Company, which has several mills in the colony. Most of the sugar estates are owned by Europeans, but some land is held by the Indian coolies, who, after the expiration of their term of indenture, generally devote themselves to agriculture. Stock-raising is not important.

The commerce of the colony is mainly with New Zealand and the Australian States, and shows an almost uninterrupted growth. In 1895 the imports, mostly from New South Wales, were £241,759, and the exports £332,209. In 1899 the former increased to £349,890, and the latter to £619,836. The leading exports for 1900 were: Sugar, £393,987; copra, £151,701; green fruit, £28,112; distilled spirits, £28,839. There is regular steam communication with New Zealand and other points in the Pacific. The total tonnage entered and cleared in 1900 was 190,820 tons. The administration of the colony is intrusted to a Governor, assisted by an Executive Council of three official members, and to a Legislative Council of twelve members. Administratively the group is divided into seventeen provinces, of which eleven are under the rule of native chiefs. The other six are in the control of European officials. The island of Rotuma is administered by a European commissioner, who has both political and legislative functions. The finances of the colony are in good condition. The revenue is derived principally from customs duties and taxes in kind levied on the natives, and generally exceeds the expenditures by several thousand pounds.

The population of the group in 1901 was 117,800, more than 80 per cent. being natives and about 15 per cent. East Indians. There are many churches and schools. The Indian coolies are imported for the sugar plantations by the Government, under whose supervision they remain for ten years. The capital of the group, Suva (q.v.), is situated on a fine harbor on the south coast of Viti Levu, and has a European population of about 1100.

The aborigines of the Fiji Islands are generally looked upon as essentially Papuan or Melanesian in origin, with a considerable Polynesian element, chiefly Tongan. Some regard the Fijians as Mongoloid-Negroid hybrids, while others have sought to discern in them, as in the Australians, an ancient strain related to the Caucasian, cropping out occasionally in features of European type not attributable to race mixture. The western Fijians are longer-headed than the eastern, and some reach a stature surpassing the European. The Fijian language closely resembles Tongan, and Tongan and Samoan influences reveal themselves in Fijian art, industry, etc. The Fijians were long famous as carpenters and ship-builders; their large canoes with sail and outrigger, to which Tongan improvements have been added, are famous. Other arts well developed in the Fiji Islands are pottery-making (unknown in Tonga) and the pattern-printing of tapa or bark cloth with blocks. The mythology and primitive religion of the Fijians were imaginative and rich in legend and poetry. The Fijians have long been Christians, and cannibalism and other savage practices for which they were once notorious are little else than memories; but that the old ideas are not completely destroyed is proved by such occurrences as the promulgation of a new religion, which was an ingenious compound of Christianity and heathenism, to the advantage of the latter, by the 'prophet' Dugomoi, in 1885. Under British government the Fijians seem to be holding their own in numbers, notwithstanding epidemics of diseases, etc.

Some of the islands of the Fiji group were discovered by Tasman in 1643 and visited by Cook in 1773. The first accurate knowledge of the archipelago was obtained through the explorations of Dumont d'Urville in 1827, and of the American expedition under Wilkes and Hale (1840-42). Though fugitive convicts from Australia settled in Viti Levu as early as 1804, the European population grew very little, owing to the hostility of the natives, who were numerous, warlike, and addicted to cannibalism. Wesleyan missionaries reached the islands in 1835, and in 1854 succeeded in converting not only Thakombau, the most powerful of the native chiefs, but the mass of the people also. Complications with the United States led Thakombau to offer the sovereignty over the islands to Great Britain (1858). The proposal was declined. Between 1860 and 1869 immigration was rapid. An attempt to establish a parliamentary government under Thakombau did not prove successful, and the offer to Great Britain was renewed and accepted (1874). Consult: Agassiz, "The Islands and Coral Reefs of Fiji," in *Museum of Comparative Zoölogy Bulletin*, vol. xxxiii. (Cambridge, 1899); Seeman, *Viti* (Cambridge, 1862); Williams and Calvert, *Fiji and the Fijians* (London, 1870); Cumming, *At Home in Fiji* (ib., 1887); Reed, *Recent Wanderings in Fiji* (ib., 1888).

FILAN′DER (from Gk. *φίλανδρος*, *philandros*, man-loving, from *φιλεῖν*, *philein*, to love + *ἀνήρ*, *anēr*, man). A small wallaby (*Macropus Brunii*) of New Guinea, which has the interesting distinction of being the first kangaroo known to Europeans. See KANGAROO.

FILANGIERI, fē′lån-jyā′rē, GAETANO (1752-88). An Italian jurist, best remembered as the author of a voluminous treatise, *La scienza della legislazione* (The Science of Legislation). He was born in Naples, of a noble family, was trained for a military career, but soon abandoned it in favor of legal and scientific studies, and when barely twenty published his first work, *Public and Private Education*. Among his early successes as a lawyer was an able defense of a royal decree, which won him the appointment of Court advocate, and led to various other offices and honors from the King. The first three parts of his principal work appeared in 1780-83, and incurred the censure of the Papal Church. Ferdinand IV., however, rewarded the author with a pension, and relieved him from all his Court duties. But his health was already broken by his arduous public services and his persistent labors upon his book, and he died prematurely at thirty-six, in Naples, whither he had returned a few months before, to accept a position in the Ministry of Finance. The *Scienza della legislazione* (1780-88), which was to have consisted of seven books, but remains incomplete, was evidently written under the influence of Montesquieu, although it is not wanting in originality. It has been translated into many European languages, that in French (1822) containing a commentary by Benjamin Constant.

His son, CARLO (1784-1867), Prince of Satriano, was born in Naples. He entered the French Army, was made a captain at Austerlitz, and fought in Spain with Murat. In 1849 he became Viceroy of Sicily, under Ferdinand II., and he was made Minister of War by Francis II. in 1859. He held this office for one year, when he fell from power, and did not again enter politics.

FILARETE, fē′lȧ-rā′tȧ, ANTONIO (called also ANTONIO AVERULINO) (c.1410-70). An Italian architect and sculptor, born in Florence. He assisted Ghiberti on the doors of the baptistery at Florence, and was engaged by Pope Eugene IV. to execute the bronze doors for Saint Peter's in Rome (1439-45), now used for the central entrance of the church. His work is an imitation of Ghiberti's masterpiece, but the subjects represented are a strange mixture of Christian and pagan thought. He was afterwards banished from Rome, and was invited to visit Milan by

Francesco Sforza, for whom he began the Ospedale Maggiore, but lived only to complete the right wing. He also made plans for the cathedral at Bergamo, and wrote a curious and interesting treatise on architecture, *Trattato di architettura* (c.1464). In this work he described an ideal city, called 'Sforzinda.' This work remained in manuscript until 1890, when it was published in Vienna. Consult von Oettingen, "Leben und Werke des Antonio Averulino," in *Beiträge zur Kunstgeschichte*, new series, vol. vi. (Leipzig, 1888).

FILA'RIA (from Lat. *filum*, thread). A parasite found in the blood, lymph, and other fluids of the human body. It was first seen by Demarquay, in 1863, in a fluid obtained from a galactocele, and was identified in 1866 by Wucherer, of Brazil. In 1868 Salisbury found the eggs in human urine. In 1872 T. R. Lewis found filariæ in the blood. *Filaria medinensis*, or Guinea worm, is found in different tissues of the bodies of negroes in Guinea, Senegal, Egypt, Arabia, Persia, and India. It is from one to ten feet long, and about one-tenth of an inch wide, and causes painful tumors, blisters, or boils, and sometimes gangrene. *Filaria sanguinis hominis nocturna*, which is about one-seventy-fifth of an inch long, is found in the blood. It is indigenous to Africa, India, China, Australia, and Brazil, and has been found in negroes in our Southern States. The parasite is transmitted by mosquitoes, as has been demonstrated by Manson and by Low. In *Culex fastigans* filaria embryos mature rapidly, after the insect has fed on the blood of a patient suffering from filariasis, and the perfect filariæ are found in the head, neck, and proboscis of the mosquito. Strong, of the Chief Surgeon's Office, Division of the Philippines, has found filariasis in Iloilo. He believes that the disease will become domesticated in the Southern States, through the return of the American soldiers. This form of filaria is a white, opaline, hair-like worm, tapering toward the ends, which are blunt. It is found only after sundown, appearing in the blood about 6 P.M. A diurnal variety has been discovered by Manson in Congo negroes, but as yet only its embryo has been seen. However, the nocturnal variety is found by day in the blood of those sufferers from filariasis who work by night and sleep by day. Granville advances the theory that the appearance in the blood of this parasite is dependent upon certain conditions of the circulation and of the chyle during sleep. Filariasis is limited between the parallels of latitude 30° N. and 30° S., unless transported by some one infected within the tropical limits. It is found in Brazil, many of the West Indies, in Mexico, and the west coast of South America, the South Sea Islands, Japan, Australia, and China, besides the countries already named as comprising the habitat of the Guinea worm. It is supposed to be the cause of several endemic diseased conditions, including elephantiasis arabum, lymph scrotum, lymph vulva, chyluria, hæmatochyluria, and ascites. Consult: Wucherer, in *Gazeta Medica da Bahia* (Brazil, December, 1868); Lewis, in *Medicinisches Centralblatt*, No. 43 (1877); and Manson, *The Filaria Sanguinis Hominis* (London, 1883).

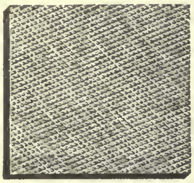
FILBERT. See HAZEL.

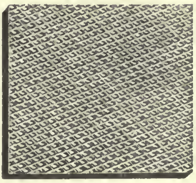
FILCH. A boy brought up as a pickpocket, in Gay's *Beggar's Opera*.

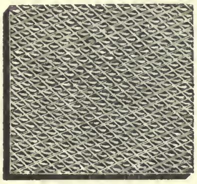
FILDES, SAMUEL LUKE (1844—). An English painter, born in Liverpool. His work is mainly genre. He studied in the South Kensington schools and the Royal Academy, made many drawings for the *Cornhill Magazine*, the *London Graphic*, and other periodicals, and illustrated the last work of Charles Dickens—*Edwin Drood*—and of Lever. He exhibited his first oil picture in the Royal Academy in 1872—"Fair, Quiet, and Sweet Rest." Fildes also painted Venetian scenes, and large pictures of the life of the English people, such as "Return of the Lost One," "The Widower," and "The Poor of London." He seems peculiarly successful in depicting the hard and sordid experience of the London suffering poor. Well equipped technically, he portrays these scenes and situations with the vivid realism that strongly impresses the beholder. Besides his competent execution, he portrays this aspect of life with a great deal of manly sympathy. He was made an A. R. A. in 1879, and a R. A. in 1887. In 1879 he painted the "Return of a Penitent," in 1884 "Venetian Flower Girl," and in 1885 "Venetians."

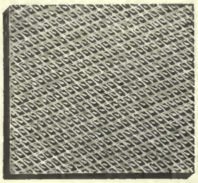
FILE (AS. *feol*, OHG. *fīhala*, *fīla*, Ger. *Feile*, OChurch Slav. *pila*, file; connected ultimately with Lat. *pingere*, to paint, OChurch Slav. *pĭsati*, to write, Skt. *piś*, to adorn). A steel instrument with sharp ridges or teeth made by the indentations of a chisel, which is employed for cutting down and shaping metals or other hard substances. Abrading instruments having the general characteristics of files are doubtless very ancient. Indeed, the file may be said to be represented in its earliest and crudest form by the rough stones used by prehistoric man in shaping his implements of war and of the chase. Artificially made files are mentioned in the Old Testament in I. Sam. xiii. 21, and they are also mentioned in the *Odyssey*. These files were doubtless crude in form, and very inefficient in operation compared with the modern tool of the same name, but the fact that they were mentioned in these early writings is proof of the consideration in which they were held by the metal-workers of ancient times. The file has continued to remain one of the most useful of hand tools for working metals, and is to-day produced in enormous numbers and with an almost endless variety of forms and characteristics.

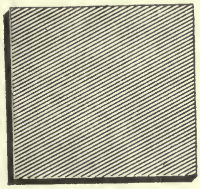
The modern file is a bar or rod of hardened steel having one end forged down to a long slim point or tang for insertion in a wooden handle, and the remainder of its length covered on one or all sides with serrations or teeth. A *rasp* is a species of file in which each tooth is an angular pit with a strong burr formed by a pointed punch, instead of a long furrow formed by a broad-bladed chisel. Files and rasps are distinguished first by their length, which is always measured exclusive of the tang, second by their shape, and third by their cut, which has reference not only to the character, but also to the relative degrees of coarseness of the teeth. The length of a file is the distance between its heel, or part of the file where the tang begins, and the point or end opposite. In general the length of files bears no fixed proportion to either their width or their thickness, even though they be of the same general shape or kind. By kind, in speaking of files, is meant the varied shapes or styles of files which are distinguished by certain technical names, as, for instance, flat, mill, and half-round. The various kinds of files are grouped according to the shape of their cross-section into quadrangular sections, circular sections, triangular sections, and miscellaneous sections. These sections are in turn subdivided, according to their general contour or outline, into taper and blunt. The term taper designates a file the point of which is more or less reduced in size, both in width and thickness, by a gradually narrowing section extending from one-half to two-thirds the length of the file from the point. The term blunt designates a file that preserves its sectional shape throughout from point to tang. The cut of files is divided, with reference to the character of the teeth, into single cut, double cut, and rasp cut, and with reference to the coarseness of the teeth into rough, coarse, bastard, second cut, smooth, and dead smooth. The accompanying illustrations show all of these cuts. The rough-cut file is one in which a single unbroken course of chisel cuts is made across its surface arranged, parallel to each other, but oblique to the centre line or axis of the file. The double-cut file has two courses of chisel cuts crossing each other, the second course with rare exceptions being finer than the first. Rasp-cut differs from single or double cut in the respect that the teeth are disconnected from each other, each tooth being made by a single-pointed tool called a punch.

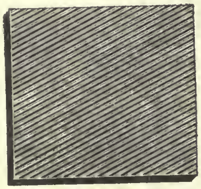

12 in. Double Cut Smooth

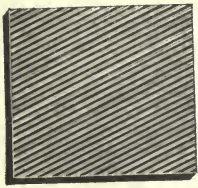

12 in. Double Cut 2d Cut

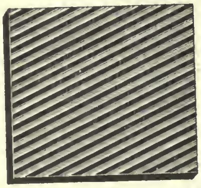

12 in. Double Cut Bastard


12 in. Double Cut Coarse


12 in. Single Cut Smooth.


12 in. Single Cut 2d Cut


12 in. Single Cut Bastard


12 in Single Cut Coarse

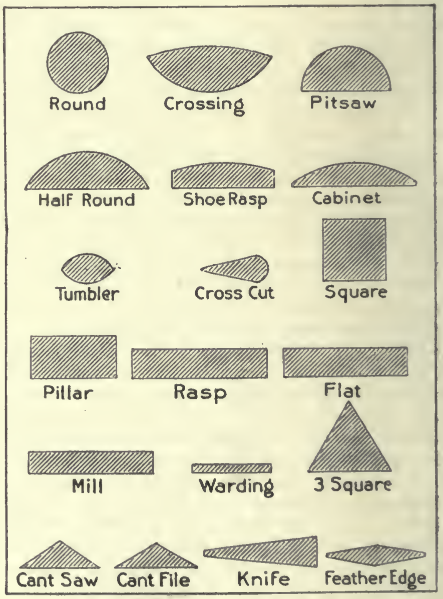
File-teeth of any of the cuts described may be arranged so as to be spaced equidistant, or they may be arranged so that the spacing varies at different points of the file. When the latter arrangement is used the files are designated as increment cut. This form of cut is controlled by the Nicholson File Company, of Providence, R. I., and Nicholson files only possess increment cut. The arrangement of the teeth in increment cut may be described as follows: (1) The rows of teeth are spaced progressively wider, from the point toward the middle of the file, by regular increments of spacing. (2) This general law of spacing is modified by introducing, as the teeth are cut, an element of controllable irregularity of spacing, which irregularity is confined within maximum and minimum limits, but is not a regular increment or decrement. (3) The teeth are so arranged that the successive rows shall not be exactly parallel, but cut slightly angularly with respect to each other, the angle or inclination be-

12 in. Rasp Smooth.

12 in. Rasp 2d Cut

12 in. Rasp Bastard.

12 in. Rasp Coarse.



CROSS-SECTIONS OF TYPICAL FILES.

ing reversed during the operation of cutting as necessity requires.

The usual different sectional shapes of commercial files are shown in the accompanying illustration. In length such files range from three inches to twenty inches. Smaller files for jewelers, die-sinkers, and watchmakers, and needle files are made of special material, and in various special sizes. As indicating the small sizes in which files are produced, it may be noted that the smallest size of Nicholson round broach file is but .033 of an inch in diameter, and about one inch long.

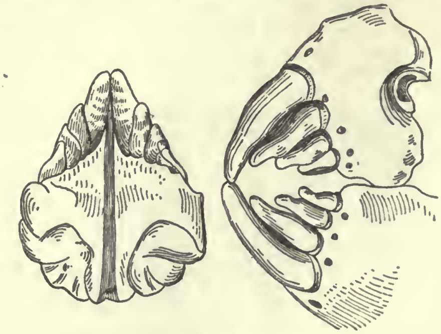
Manufacture. Formerly, all files were handmade, the steel bar being forged to shape, ground smooth, and cut by hand tools. Most files are now made by machinery designed to perform all of these essential operations. The old method of hand cutting has a peculiar interest because of the deftness and skill required of the workman, and it will be described briefly for this reason, and also because it will help to explain the nature of the work required of modern file-cutting machinery. The following description is taken from Holtsapffel's *Turning and Mechanical Manipulation:*

"The first cut is made at the point of the file; the chisel is held in the hand at a horizontal angle of about 55° with the central line of the file, . . . and with a vertical inclination of about 12° to 14° from the perpendicular. . . . The blow of the hammer upon the chisel causes the latter to indent and slightly to drive forward the steel, thereby throwing up a trifling ridge or bur; the chisel is immediately replaced on the blank and slid from the operator, until it encounters the ridge previously thrown up, which arrests the chisel or prevents it from slipping farther back, and thereby determines the succeeding position of the chisel. The heavier the blow, the greater the ridge, and the greater the distance from the preceding cut at which the chisel is arrested. The chisel, having been placed in its second position, is again struck with the hammer, which is made to give the blows as nearly as possible of uniform strength; and the process is repeated with considerable rapidity and regularity, 60 to 80 cuts being made in one minute, until the entire length of the file has been cut with inclined, parallel, and equidistant ridges, which are collectively denominated the first course. So far as this one face is concerned, the file, if intended to be single cut, would be then ready for hardening. Most files, however, are double cut; that is, they have two series or courses of chisel cuts. In cutting the second course, the chisel is inclined vertically as before, at about 12°, but its edge only a few degrees from the transverse line of the file, or about 5° to 10° from the rectangle. The blows are now given a little less strongly, so as barely to penetrate to the bottom of the first cuts, and from the blows being lighter they throw up smaller burs, consequently the second course of cuts is somewhat finer than the first. The two series, or courses, fill the surface of the file with teeth, which are inclined toward the point of the file."

At first sight it would appear from the simplicity and continual repetition of the movements required in file-cutting that it was an operation especially adapted to be performed by machinery. Nevertheless, it was not until many years after the first inventor of a file-cutting machine had patented his device that file-cutting machines were successfully used, and that machine-cut files could compete with the hand-made product in the market. Among the notable inventors of file-cutting machines may be mentioned Duvesger (1699); Fardonet (1725); Thiout (1740); Brachal and Gamin (1765-78); Raoul (1800); Ericsson (1836); Robinson (1843); and Winton (1847). None of these machines was commercially successful. In 1865, however, Mr. W. T. Nicholson of Providence, R. I., invented a file-cutting machine, which, as improved and modified from time to time, is now extensively used in the United States. About the same time M. Bernot, a Frenchman, devised a machine which proved commercially successful. Briefly described, the successful forms of file-cutting machines consist of a moving table on which the file-blank is fixed, and which moves it progressively under a sort of trip-hammer arrangement carrying cutting chisels. In making machine-made files the bars of steel are first forged by hand or by machines, and then ground smooth. The smoothed blank is then run through the cutting machine. The final process is to temper and harden the cut file.

Filing. To the uninitiated this may seem a simple operation of rubbing one piece of metal upon another, requiring only muscular strength, and no skill. This is far from being the case, for a skillful workman will in a given time, with a given amount of muscular work, cut away a far greater quantity of metal with a file than one who is unskillful, for he makes every tooth *cut into* the work, instead of *rubbing over* it. To do this, he must adapt the pressure and velocity of motion of the file to the coarseness of its teeth, and the hardness, brittleness, and toughness of the material he is working upon. To *file flat*—that is, to avoid rounding the sharp edges of a narrow piece of work—is very difficult, and some years of continual practice is required before an apprentice can do this well, especially in 'smoothing up' or finishing work before polishing, and there are some who never succeed in filing, smoothing, and polishing without rounding the edges of fine work. The power of doing this constitutes the main test of skill among mathematical-instrument makers and other metal-workers. The flattest surface can be obtained by laying the work, where its form admits, upon a piece of cork held in the vise, and filing it with *one hand;* the pressure on the file being communicated by the forefinger. It is mainly to aid the workman in filing flat that the rounded or bellied form is given to files; this partially compensates the tendency of the hands to move in a curved line with its convexity upward when they move forward, and apply pressure, as in the act of filing.

FILEFISH. One of a family (Monacanthidæ) of small tropical and semi-tropical fishes closely related to the plectognath trigger-fishes (q.v.). The scales are very small and rough, giving the skin a velvety appearance, and making it serviceable as a polishing material. The name refers to the file-like appearance of the stout dorsal spine, which is rough, and armed behind with two rows of barbs. The type genus, Monacanthus, contains several species, but the best known filefish is the 'barnacle-eater' (*Alutera Schœpffi*), which ranges northward to New England, may be 18 inches long, and has a "bright skin, sometimes of an orange and sometimes of a tawny hue." It is a favorite object in aquariums. The habits of the group are much the same as those of the trigger-fishes (q.v.). See Plate of PLECTOGNATH FISHES.



DENTITION OF FILEFISH.
Palatal and profile view of the teeth.

FILELFO, fē-lĕl′fō (L. **PHILELPHUS**), FRANCESCO (1398-c.1481). An Italian humanist, born at Tolentino. He studied at Padua, and in 1417 was called to teach moral philosophy and eloquence at Venice. There he became distinguished as an expositor of the works of Vergil and Cicero, which then constituted the principal textbooks in his subjects. In 1419 he was appointed secretary to the Venetian consul at Constantinople, where he acquired an excellent knowledge of the Greek language and a valuable collection of Greek manuscripts. From 1427 he taught at Venice, Bologna, and Florence, and from 1440 at Milan, where he was also attached to the Court of the Duke, Filippo Visconti, as poet and orator. He wrote for the next Duke, Francesco Sforza, 12,800 lines of an epic known as the *Sforziad*. In 1475 he went to Rome, and subsequently accepted the chair of Greek at Florence. He was neither a profound nor an accurate scholar, but his energy did much to further the spirit of learning inspired by Petrarch. Consult: Rosmini, *Vita di Filelfo* (Milan, 1808); and Symonds, *The Renaissance in Italy* (London, 1877).

FILE-SHELL. A pholad. See PHOLAS.

FILIATION (from Lat. *filius*, son). In law, the judicial determination of the paternity of a person. This may be claimed with the view of establishing legitimacy with reference to inheritance, or to determine the paternity of a bastard, in order to charge upon the father the support of his illegitimate offspring. In the United States the term is more commonly employed in the latter sense, as in the expression 'filiation proceedings' for bastardy proceedings. See BASTARD; LEGITIMACY; PARENT AND CHILD.

FILIBUSTERS (Sp. *filibustero*, from Fr. *flibustier*, *fribustier*, from Dutch *vrijbueter*, *vrijbuiter*, freebooter, from *vrij*, free + *buiter*, from *boete*, Eng. *boot*, profit). The name once applied to a class of piratical adventurers in the West Indies during the seventeenth century (see BUCCANEERS), but now generally used to designate any group or association of men who, in disregard of international law, forcibly intervene as private individuals in the affairs of any foreign State with which their own Government is at the time on terms of peace. In American history the term is applied specifically to those citizens of the United States, or residents therein, who, at various times in the nineteenth century, intervened in the affairs of the West Indies, or of Central or South America, for the purpose of freeing colonies from Spanish domination or independent States from misgovernment, frequently with an underlying motive of securing the annexation of additional territory to the United States, and in many cases of extending the area of slavery and thus augmenting the influence of the 'slave power' in governmental affairs. Aaron Burr planned to lead a great filibustering expedition into Mexico and Central America in 1806-07, and the acquisition of Texas, in 1845, was brought about chiefly by filibusters from the Southern States; but the most famous expeditions in American history were those of Lopez and Walker. Lopez, after making several fruitless attempts, in 1850-51, to effect the liberation of Cuba, was finally, on August 16, 1851, defeated, captured, and executed. Walker succeeded (1855) in overturning the Government of Nicaragua, but quarreled with the native leaders, and in 1857 was brought back to the United States by an American naval officer, to whom he had surrendered. He subsequently (1857-60) organized three more expeditions, each of which failed, and in September, 1860, was routed by the President of Honduras and summarily executed. (See LOPEZ, NARCISO; and WALKER, WILLIAM.) Minor expeditions were sent from the United States to Cuba during the years 1868-98, but they accomplished little and attracted relatively little attention, though much excitement was caused in 1873 by the brutal execution at Santiago, Cuba, of a number of Americans, mostly filibusters, found by the Spanish authorities aboard the captured steamer *Virginius*. Consult Roche, *Byways of War: The Story of the Filibusters* (Boston, 1901). See VIRGINIUS MASSACRE, THE.

FILICAJA, fē′lē-kä′yȧ, VINCENZIO DA (1642-1707). An Italian lyric poet, who first came into note through a series of lofty odes celebrating the delivery of Vienna in 1683 from the besieging forces of the Turks. Among others whose attention was attracted by these poems was Queen Christina of Sweden, who bestowed liberal patronage upon him and made him a member of her recently founded academy at Rome; in return he composed many of his most touching verses in her honor. In 1696 the Grand Duke of Tuscany appointed him Senator and Governor of Volterra, and in 1700 Governor of Pisa, an office which he held until the time of his death. Filicaja is interesting as one of the best examples of the purely academic poet. A collected edition of his poems, begun by Filicaja, was completed by his son after his death, and published under the title *Poesie toscane* (Florence, 1707). Consult: Amico, *Poesie e lettere di Vincenzio da Filicaja* (Florence, 1864), and Garnett, *A History of Italian Literature* (London, 1898).

FILICALES, fĭl′ĭ-kā′lēz. See FERN.

FILIGREE (formerly *filigraine*, *filigrane*, Fr. *filigrana*, from Lat. *filum*, thread + *granum*, grain; the old filigree work being a combination of these two elements). The name applied to delicate wirework ornaments, usually of gold or silver wire, twisted and plaited into spirals and other convoluted forms, combined to form a sort of metallic lacework, and joined at their points of contact by gold or silver solder and borax, by the help of the blowpipe. Small grains or beads of the same metals are often set in the eyes of volutes on the junctions, or at the intervals, at which they will effectively set off the wirework; in the perfect (Greek) form of the work, the gold ground was covered with infinitesimal gold grains. The more delicate tracery is generally protected by framework of stouter wire. It is used for brooches, earrings, crosses, head ornaments, and other pieces of jewelry of a very light and elegant character. This work is now chiefly done in Malta, India, Genoa, some Tuscan villages, the Ionian Islands, and some parts of Turkey. The technique of filigree was not unknown to Egyptian jewelers, but it was perfected by Greek art, and as until recently most of its examples were found in Italian tombs, such works have been wrongly called Etruscan, whereas they were really imported from Greece.

The Greek filigree work of the golden age of the fifth and fourth centuries is probably the most beautiful jewelry ever made. The delicate frosting of the gold surface, produced by the sprinkling of fine gold grains, which is an essential part of perfect filigree work, appeared to be a lost process after the decline of Greek art. The famous Roman collector, Castellani, rediscovered it, however, and executed many beautiful copies. The firm of Tiffany has more recently carried its perfection still further. Necklaces, tiaras, hairpins, safety pins, earrings, rings, bracelets, are the principal classes of personal jewelry in the original Greek works. The Vatican, Louvre, and Metropolitan Museums have the greatest quantity of works found in Italian tombs, while the British Museum has also a large number discovered in Greek lands. The latest Greco-barbaric forms are best shown in specimens from southern Russia, at Saint Petersburg and Kertch.

During the period when the secret of soldering the gold frosting appeared almost lost, from the Roman period to modern times, that part of the technique was most popular which consisted of the use of wirework. But the secret was not lost, only the fashions had changed. In wirework the Indian workmen seem to be the best heirs of the Greeks. They retain many Greek patterns, and work them in the same way, down to the present day. Wandering workmen are given so much gold, coined or rough, which is weighed, heated in a pan of charcoal, beaten into wire, and then worked in the courtyard or veranda of the employer's house, according to the designs of the artist, who weighs the complete work on restoring it, and is paid at a specified rate for his labor. Very fine grains of gold are methods of ornamentation still used. This work requires the utmost delicacy of hand, and is of extraordinary richness of effect.

Passing to later times, we may notice in many collections of early mediæval jewel work, reliquaries, covers for the Gospels, etc., made either in Constantinople from the sixth to the twelfth century, or in monasteries in Europe, in which Byzantine goldsmiths' work was studied and imitated. These objects—though not entirely in filigree work—besides being enriched with precious stones, polished, but not cut into facets, and with enamel, are often decorated with filigree. Large surfaces of gold are sometimes covered with scrolls of filigree soldered on; and corner pieces of the border of book-covers or the panels of reliquaries are not infrequently made up of complicated pieces of plaited work, alternating with spaces incrusted with enamel. Byzantine filigree work occasionally has small stones set among the curves or knots. In the north of Europe, the Goths, Saxons, Britons, and Celts were from an early period skillful in several kinds of goldsmiths' work. Brooches, and other personal ornaments in England, were incrusted with enamel work varied with borders or centres of filigree. The Irish filigree work is especially varied in design, and reached its highest perfection in the tenth and eleventh centuries. The Royal Irish Academy in Dublin contains a number of such reliquaries and personal jewels, of which filigree is the general and most remarkable ornament. Instead of fine curls or volutes of gold thread, the Irish filigree is varied by numerous designs, in which one thread can be traced through curious knots and complications, which, disposed over large surfaces, balance one another, but always with special varieties and arrangements difficult to trace with the eye. The long threads appear and disappear without breach of continuity, the two ends generally worked into the head and tail of a serpent or a monster. The reliquary containing the 'bell of Saint Patrick' is covered with knotted work in many varieties. A two-handled chalice, called the 'Ardagh cup,' has belts, bosses at the junctions of the handles, and the whole lining of the foot ornamented with work of this kind of extraordinary fineness. Much of the later mediæval jewel work all over Europe down to the fifteenth century, on reliquaries, crosses, crosiers, and other ecclesiastical goldsmiths' work, is set off with bosses and borders of filigree. Mohammedan damascene work must be carefuly distinguished, but filigree in silver was practiced by the Moors of Spain during the Middle Ages with great skill, and was introduced by them and established all over the peninsula, where silver filigree jewelry of delicate and artistic design is still made in considerable quantities. The manufacture spread over the Balearic Islands, and among the populations that border the Mediterranean, and continues all over Italy, and in Albania, the Ionian Islands, and many other parts of Greece. That of the Greeks is sometimes on a large scale, with several thicknesses of wire alternating with larger and smaller bosses and beads, sometimes set with turquoises, etc., and mounted on convex plates, making rich ornamental headpieces, belts, and breast ornaments. Filigree silver buttons of wirework and small bosses are worn by the peasants in most of the countries that produce this kind of jewelry. Silver filigree brooches and buttons are made also in Denmark, Norway, and Sweden. Little chains and pendants are added to much of this northern work. Beautiful specimens have been contributed to the various international exhibitions. Some very curious filigree was brought from Abyssinia after the capture of Magdala—arm-guards, slippers, cups, etc. They are made of thin plates of silver, over which the wirework is soldered. The filigree is subdivided by narrow borders of simple pattern, and the intervening spaces are made up of many patterns, some with grains set at intervals. Great interest has been felt in the revival of the designs of antique jewelry by Signor Castellani. He collected examples of the peasant jewelry still made in many provinces of Italy on extraordinary designs preserved from a remote antiquity. Most of the decoration is in filigree of many varieties. It was in part through the help of workmen in remote villages, who retained the use of various kinds of solder, long forgotten elsewhere, that the fine reproductions of antique gold filigree have been so beautifully executed in Italy, and by Italian jewelers, and are now thoroughly appreciated by all art-lovers. Consult the authorities referred to under JEWELRY.

FILINTO, fė-lēn′tō, ELYSIO. See NASCIMENTO, FRANCISCO M. DO.

FIL′IO′QUE. A Latin phrase meaning 'and from the Son,' which was added to the Nicene Creed by the Western Church, and has formed a prolific source of controversy between the Greek and Roman Catholic Churches. According to the received Greek text, this article of the Creed runs thus: "And we believe in the Holy Ghost, . . . who proceedeth from the Father." This was the form common to all sections of the Church in the fifth century. At the third synod of Toledo (A.D. 589), the Spanish bishops used a Latin version which contained the *filioque* addition, thus: "I believe in the Holy Ghost, . . . who proceedeth from the Father *and the Son.*" This alteration met with favor in the Western Church, especially in Spain and Gaul, but was very offensive to the East. Passages could be cited from the writings of Augustine and Leo the Great, in support of the doctrine of the 'double procession,' as it is technically called, but its formulation as part of the Creed was destitute of ecclesiastical authority. The early ecumenical councils had committed the Church to the 'single procession,' and the symbol which expressed this faith had been pronounced unalterable. Nevertheless the Western Church contended, first, for the truth of the doctrine implied in the *filioque,* and later, for the symbolic authority of the clause itself.

In 809 Charlemagne convened a synod at Aix-la-Chapelle, to examine the whole question of the proper wording of this clause. The decision was in favor of the form sanctioned at Toledo. But the case coming before Pope Leo III., he discreetly refrained from giving his approval to the change in the Creed, though he admitted the truth contained in the doctrine as a proposition of theology. The earliest formal recognition of the *filioque* by a Pope was in 1014, when Benedict VIII. permitted its use at the coronation of Henry II. Meanwhile the break between the Eastern and the Western Church had come. Photius, Patriarch of Constantinople, had charged Rome with violating the canons by allowing a change to be made in the Creed, and this, together with other causes which need not be specified here (see GREEK CHURCH), brought about the great schism. Frequent efforts have since been made to heal this breach, but without success. Even the most hopeful attempts of Greek and Roman Catholics to reach some agreement on the *filioque* question, e.g. at the councils of Lyons (1274), and especially of Ferrara—Florence (1438-39)—have accomplished no permanent result. That the Eastern Church has persistently refused to admit the validity of the Roman contention may be seen from such official pronouncements as the *Orthodox Confession of the Eastern Church* (1643), and the *Larger Catechism of the Orthodox Eastern* (Russian) *Church* (1839). The great Greek theologian and doctor, John of Damascus, laid down the limits of orthodox liberty, when he said, "The Holy Ghost proceeds from the Father, through the Son." It is worthy of note that these words formed the basis of doctrinal agreement on this Creed article, reached at a conference of Old Catholic, Greek, and Anglican divines in Bonn in 1875, but no practical result followed their deliberations. Consult: E. S. Ffoulkes, *Historical Account of the Addition of the Word Filioque to the Creed* (London, 1867); Hefele, *History of the Councils,* vol. iii., English translation (London, 1883); Schaff, *Creeds of Christendom,* vol. ii. (New York, 1890).

FILIPINO, fē-lė-pē′nō. See PHILIPPINES.

FILIPPI, fė-lėp′pė, FILIPPO DE (1814-67). An Italian traveler and naturalist. He was born at Milan, and after holding professorships in zoölogy at Pavia and Turin, made a tour to Persia in 1862, which is described in his *Note di un viaggio in Persia* (1865). He was director of the zoölogical exploring expedition sent out in the *Magenta* to circumnavigate the globe, but died on reaching Hong Kong. He was the author of the important work entitled *Delle funzioni riproduttive negli animali* (2d ed. 1856).

FILLAN, fĭl′an, SAINT. Two Irish or Scotch saints, whose histories are more or less legendary. (1) SAINT FILLAN, or Faolan, the leper, was commemorated by a church in Scotland at the east end of Loch Erne in Perthshire, where 'Saint Fillan's well' was long believed to have supernatural power of healing. He also had a church in Ireland at Ballyheyland (anciently called Killhelan or Kill Faelain), in the barony of Cullenagh, Queen's County. His day was June 20th. (2) SAINT FILLAN, the abbot, lived in the eighth century. He was a native of Ireland, became a monk there, and went to Scotland, where he seems to have lived in Perthshire. His chief church was there, and also a well-endowed priory dedicated to him. The silver head of his crosier, or pastoral staff—called the 'coygerach' or 'quigrich'—appears in record as early as 1428, and, after a curious history, is now preserved in the museum of the Society of Antiquaries of Scotland at Edinburgh. A hand-bell which bore his name, and was believed to work miracles, is also in the same museum. Consult: Wilson, *The Quigrich or Crosier of Saint Fillan* (Toronto, 1859); also, "Historical Notices of Saint Fillan's Crosier," by Dr. Stuart, reprinted from the *Proceedings of the Society of Antiquities of Scotland,* vol. xii. (1878).

FILLE DE MADAME ANGOT, fē′y′ de mȧ′-dȧm′ äɴ′gō′, LA (Fr., The Daughter of Madame Angot). An amusing opera in three acts, with words by Clairville, Siraudin, and Koning, and music by Lecocq, first given at Brussels in 1872. Claire Angot spurns the hairdresser Pomponnet, and loves the celebrated Ange Pitou, who is enamored of the famous comedienne Mlle. Lange. Claire finally marries Pomponnet. The music is attractive and graceful, and the orchestration very successful.

FILLE DU RÉGIMENT, dụ rȧ′zhė′mäɴ′, LA (Fr., The Daughter of the Regiment). An opera by Donizetti (1840).

FILLET (OF. *fillet,* ML. *filettum,* small thread, diminutive of Lat. *filum,* thread). In architecture, a narrow flat surface or band, like a ribbon, used with moldings. In heraldry (q.v.), a charge. In Greek and Roman religious rites, a white and red band of woolen stuff, worn upon the forehead, as a sign of religious consecration and of inviolability. It was used by the priests, and hence is spoken of usually as a sacred fillet.

FILL′MORE, Millard (1800-74). The thirteenth President of the United States. He was born in Cayuga County, N. Y., February 7, 1800. After a youth of industry with little opportunity for education, he undertook the study of law, and was admitted to the bar in 1823. His practice of his profession, chiefly at Buffalo, continued actively for twenty-four years. His political life began in 1828 with his election as an Anti-Mason (q.v.) to the State Legislature, where he served for three terms. In 1832 he was elected to Congress as a Whig, and retained his seat, with one intermission (1835-37), until 1843. During this period he was prominent as a debater on the Whig side, upheld the right of petition, served as chairman of the Committee on Ways and Means in the Twenty-seventh Congress, and reported the Tariff Act of 1842, of which he was virtually the author. He sought without success the Presidential nomination in 1844; and in the same year he ran for Governor of the State on the Whig ticket, but was defeated by Silas Wright (q.v.). He became Comptroller of New York State in 1847. In the following year he was elected by the Whig Party Vice-President on the ticket with Zachary Taylor (q.v.). Upon the death of the President, in July, 1850, Fillmore succeeded him, and the change in administration was marked by the early passage of the Compromise Measures. (See Compromise Measures of 1850.) Fillmore's support of those measures, and especially his signing of the Fugitive Slave Law (q.v.), alienated many of the extreme Northern members of his party. Aside from the developments of the slavery problem, his administration was marked by one conspicuous event—the establishment of diplomatic relations with Japan. In 1852 he was a prominent Presidential candidate before the National Convention of the Whig Party. In 1856 he was a candidate for the Presidency on the ticket of the Know-Nothing (q.v.) or American Party, and although supported by many conservative Whigs, such as Edward Everett (q.v.), he received the electoral votes of only one State, Maryland. He took no active part in the Civil War, and spent the remaining years of his life at Buffalo, where he died March 8, 1874. Consult: Chamberlain, *Biography of Millard Fillmore* (Buffalo, 1856); and Wilson, *The Presidents of the United States* (New York, 1894). For an account of his administration, see United States.

FIL′MER, Sir Robert (?-1653). An English political writer, famous for his defense of absolutism and the divine right of kings. He was educated at Trinity College, Cambridge; was knighted by Charles I.; was active as a Royalist during the English Civil War, and became prominent as a writer in favor of absolutism. His most important work is his *Patriarcha; or, The Natural Power of Kings* (1680). The book called forth elaborate refutations from Algernon Sidney, in his *Discourses Concerning Government* (1698), and from Locke, in his *Two Treatises of Government: In the Former, the False Principles and Foundation of Sir R. Filmer and His Followers are Detected and Overthrown,* etc. (1690). Filmer also wrote: *The Anarchy of a Limited and Mixed Monarchy* (1648); *The Power of Kings, and Particularly of the King of England* (1680); *The Freeholder's Grand Inquest* (1648); *Observations Concerning the Original of Government* (1652); *Observations on Aristotle's Politiques Touching Forms of Government* (1652); and *Advertisement to the Jurymen of England Touching Witches, together with the Difference Between a Hebrew and an English Witch* (1653).

FILOCOPO, fē-lō-kō′pō, It. A prose version by Boccaccio, written at Naples about 1340, of the old French metrical romance *Flore et Blanchefleur.* It is said to have been inspired by the author's passion for Maria, illegitimate daughter of the King of Naples.

FILON, fē′lôɴ′, Auguste (1800-75). A French historian, born in Paris. He was the author of many valuable works, which include: *Histoire comparée de France et d'Angleterre* (1832); *Histoire de l'Europe au XVIème siècle* (1838); and *Histoire de la démocratie athénienne* (1854). His son, Pierre Marie Augustin (1841—), was the tutor of the Prince Imperial from 1867 to 1870. He wrote several histories, novels, and critical reviews, such as *Guy Paton, sa vie, sa correspondance* (1862); *Histoire de la littérature anglaise* (1883), crowned by the Academy; *Prosper Mérimée* (1894); and a novel, *Les mariages de Londres* (1875), under the pseudonym of Pierre Sandrié.

FILOSTRATO, fē-lō′strȧ-tō, It. A narrative in poetic form by Boccaccio (1341), closely followed by Chaucer in *Troilus and Cressida.*

FILTER AND FILTRATION (Fr. *filtre,* doublet of Fr., OF. *feutre,* It. *feltro,* felt, from OHG. *filz,* Ger. *Filz,* AS., Eng. *felt;* connected with OHG. *falz,* Ger. *Falz,* fold, Lat. *pellere,* to drive). The original and oftentimes the sole object of filtration is the removal of suspended matter from liquids by the mechanical process of straining. Recently science has shown that in some of its applications filtration is far more than a straining process, particularly in water and sewage purification, where, by the agency of bacteria, organic matter, both in solution and suspension, is removed or transformed, thus preventing or delaying the clogging of the filter by the latter. The end to be attained in filtration may be the securing or the recovery of matter suspended in a liquid, or the clarification or other purification of the liquid itself. The *filter* may be either a vessel of porous material, such as carbon in some form or baked clay, or it may be a vessel containing a granular or fibrous material, supported on a perforated bottom. Granular filtering materials may be sand, crushed quartz, powdered or crushed glass, bone or wood charcoal, crushed coke or cinders, or other substances more or less similar. Fibrous filtering material may be cotton, wool, or asbestos, either in the form of cloths or otherwise, and like substances. Both experience and theory show that in many instances the material to be filtered out adheres to the surface of the individual grains or fibres of the filtering material, often forming a layer or membrane to the surface of the walls of filter vessels. In such cases adhesion and agglutination assist in the process, and the reduction of the size of the pores of the filtering medium, whether through straining or adhesion, makes it more difficult for the suspended matters to pass through. Another contributing cause is the tortuous passage through the filtering material, the several particles of the latter serving as so many dams or barriers to the progress of the suspended matters, adhesion and agglutination also aiding in this process. The speed or capacity of filters, and also their efficiency or thoroughness, may be aided in some cases by the use of a coagulant, which serves to bring the suspended matters together in flakes or clots which are readily retained by the filtering material. The burden upon filters, or their tendency to clog, may be lessened in some cases by previous sedimentation. When filters deteriorate so they give a filtrate deficient in quality or quantity, they may be either discarded or cleaned, according to their nature. Sometimes they may be washed by reversing the flow of liquid through them. See SEWAGE PURIFICATION; WATER PURIFICATION.

FILTER PRESSES. A combination of strainers or filters with some form of press designed to hasten the process or increase the thoroughness of separating liquids and solids. In many cases the filtering is nominal only, the filter cloth being used chiefly to retain the solid matter, which otherwise would be squeezed out between the plates or racks of the press. The force used in pressing may be applied by hand, steam, or other power, by means of simple screws or more or less complicated gearing, or air-pressure may be used. Common examples of the former are the ordinary cheese and cider presses, and tankage presses used in garbage and fat-rendering establishments. Compressed air is sometimes used both to fill and operate presses dealing with matter having a high percentage of water, like sewage sludge. (See SEWAGE PURIFICATION.) Hydraulic power may also be used to operate filter presses.

FILTH DISEASE. A term that may be applied to any disease caused or supported by accumulation of filth. The term, although useful, is not strictly scientific. It has been applied to typhoid fever, cholera, dysentery, and diarrhœa, as well as to erysipelas, pyæmia, septicæmia, and puerperal fever. These were called 'filth diseases,' on the supposition that they were caused by putrefying excrement, garbage and refuse, leakage and seepage from cesspools, privy vaults, and sewers, through which wells and springs, as well as the atmosphere, may become polluted and cause disease. Since the discovery that the causative principle in each of these diseases is a specific bacillus, the term 'filth diseases' has fallen into partial disuse. It is known that bacteria do not pass through the air accompanying the vapor arising from a fluid, and that, in general, gases and vapors cannot convey infection, bacteria being carried by spray or dust. Yet it is true that allowing filth, particularly human excrement, to accumulate so that it may gain access to drinking-water, or may attract insects which will carry it about, is to invite contamination and infection by the bacteria that may exist in such filth. Thus, flies may carry fæcal matter about and transfer it to food. Typhoid fever is spread through the medium of water or milk or other food which has been contaminated by the excrement of patients suffering with the disease. Want of personal cleanliness may encourage disease, and an accumulation of refuse affords a nidus for the multiplication of pathogenic germs. It is therefore clear that preventing the accumulation of filth must in a large measure serve to prevent also filth diseases. See INSECTS, PROPAGATION OF DISEASES BY; TYPHOID FEVER.

FILUM AQUÆ (Lat., thread of the stream). In law, the imaginary line, running along the centre of a natural stream, which is the presumptive boundary between the lands on the opposing shores. When one conveys lands bounded by a watercourse, he is presumed, if the stream be private and the bed of it is vested in the grantor, to convey to the centre or thread of the stream. This presumption may be rebutted by a plain expression of a contrary intention in the deed, or the whole of the stream may be granted with the land on either side. But where, as is usually the case, a stream is taken as the boundary without special restriction, it is the thread, or *filum aquæ*, which is understood as the line between the riparian owners. This thread has no reference to the position of the channel (q.v.), nor does its location follow the flow of the water; but it is, as a general thing, a line midway between the banks and following the contour of the shore as nearly as possible. The principle of the *filum aquæ* finds its most frequent illustration in the case of riparian proprietors in private streams, but it is equally applicable to the delimitation of frontiers between opposing States or minor political divisions. See RIPARIAN RIGHTS.

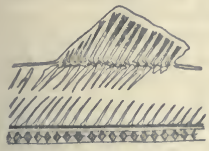
FIMBRIATED (Lat. *fimbriatus*, fringed, from *fimbria*, border, fringe). A term in heraldry, applied to an ordinary having a narrow border or edging of another tincture.

FIN (AS. *finn;* connected with Lat. *pinna*, fin). An organ possessed by aquatic animals and used for locomotion in the water.

GENERAL CONSIDERATIONS. Fins are cutaneous folds which may or may not be supported by fin-rays or other framework. In the squid the fins are cutaneous lobes; in pleuropods they are morphologically paired parts of the foot. Folds of skin occur on the tails of certain adult and larval Amphibia. The fore legs or 'flippers' of marine turtles and cetaceans are modified into a fin-like organ, besides which the tail of cetaceans ends in a fin, and a fatty dorsal fin may also be present. The fins of both turtles and cetaceans are supported by a bony framework.

FINS OF FISHES. Fishes' fins may consist of mere folds of the skin, or these membranous folds may be supported by cartilaginous or bony rods, the fin rays. When the supporting rays are unsegmented, in which case they are usually strong, we have a spiny-rayed fin like the first dorsal of the perch; the whole or a part of a given fin may be spiny-rayed. Such fishes are classed as 'acanthopterous.' When the rays are segmented, we have soft-rayed fins, and the fishes possessing only such are classed as 'malacopterous.' Fins arise as folds of the skin. In young fishes these folds are much more extensive, and later disappear, except in the region where the permanent fins are to develop. For the wholly different fins of certain ancient fishes, and the few existing lung-fishes, see DIPNOI.

Fins are of two kinds—paired and unpaired. The paired fins, placed at or near the ventral side of the body, are the pectoral and anal, corresponding to the anterior and posterior limbs respectively of higher vertebrates. Along the median dorsal line we may have one or more unpaired fins—the dorsal fins. The caudal fin terminates the body posteriorly. The anal fin (usually one, but sometimes several) is the unpaired fin in the median ventral line of the body, posterior to the anus. In flounders and in certain fish embryos there is a continuous dorsal and ventral fold of skin supported by fin-rays. In most adult fishes only isolated patches of the continuous fin remain — two dorsal, one ventral, and one caudal. See illustrations under Fish.



FIN STRUCTURE.

Diagram showing the relation of the fin-bones (rays) of the dorsal fin of a teleost fish to the underlying flesh and spinal column.

Fins may be variously modified. The pectorals may be greatly broadened and lengthened, and act as flying organs, as in the flying fishes. The ventral fins may be entirely absent, as in the Apodes. They may be united in a manner to produce a sucking disk, as in the lumpsucker, or the dorsal fin may be transformed into a sucking disk, as in the remora. The anals may be entirely wanting, as in certain sharks. The modifications of the caudal fin (tail) fall into two forms, proposed by Agassiz, which are characteristic of groups and much used in the classification of fishes. These forms are:

Homocercal. A condition where the caudal fin is symmetrical as to the axis of the body; i.e. the lobes are equal, and the spine (then said to be 'isocercal') ends at the middle of the base of the fin. The perch and salmon have such tails.

Heterocercal. A condition when the upward bending of the spine and its extension into the upper lobe cause an evident inequality in the lobes, as in sharks. In this case the spine is said to be 'diphycercal.'

FINAL CAUSE. See Causality.

FINALE, fê-nä′lȧ (It., end). The name given to that part of a musical composition which finishes the act of an opera; also to the last movement of a cyclical instrumental composition, as in the symphony, quartet, quintet, sonata. etc. The character of the finale in purely instrumental works is generally lively. In the opera it depends on the subject, sometimes being an aria alone, instead of the usual full concerted music for soli and chorus.

FINALE NELL'EMILIA, nĕl′lȧ-mē′lyȧ. A city in North Italy, on the Panaro, 27 miles northeast of Modena (Map: Italy, F 3). It has a trade in cattle, and manufactures silk. Population, 13,000.

FINAL′ITY JOHN. A nickname applied to Lord John Russell, who advocated the Reform Bill of 1831 and spoke of it as a 'finality.'

FINANCE′ (Lat. *finantia*, payment, derivative of *finare*, to pay a fine, from Lat. *finis*, end, settlement). A term which is popularly applied to the management of transactions involving large sums of money, such as the floating of great corporate enterprises and the stock-exchange transactions incident thereto; or, on the other hand, the administration of the receipts and expenditures of nations, States, or cities. The operations first named are frequently designated 'private finance,' while the latter is spoken of as 'public finance,' or simply finance. The rules of private finance, if such there be, have not yet been formulated, and it is indeed only in recent years that economic writers have sought to coördinate the rules and principles of public finance into a science of finance. Scientific usage restricts the term public finance to questions affecting the expenditure, revenue, and debt of governments, although in a popular sense it is applied to questions of monetary and banking policy.

The science of finance is much younger than the art of finance, and this dates only from the rise of the modern State. In the latter, public needs are met by an expenditure of money drawn from the people by taxation and other methods, while in the mediæval State such needs were largely met by direct personal services. These have been almost entirely superseded by the obligation to pay taxes, and by the payment in money from the public treasury for such services as are required; but there are reminders of the older system at the present time. Of these the most conspicuous is the obligation to bear arms; but a homely illustration is found in the road taxes of rural communities, which are so often satisfied by actual labor upon the roads.

While questions of public policy respecting the fiscal operations of the Government form a large part of the literature of economics, it was not until the latter half of the nineteenth century that the general use of the term finance became common among English writers to designate this group of phenomena. The importance of this development lies in the fact that before it took place all these questions were regarded from the standpoint of the individual, instead of that of the State. The former is apt to be one of hostility, the latter at least of sympathy. While earlier writers emphasize the dangers of taxation, the oppression which it causes, the disturbances in the economic life of the community which it involves, later writers recognize certain normal activities for the Government, the satisfaction of its needs by taxation as appropriate, and look upon the payments of the citizens, not as sums wrung from them by extortion, but as assessments for the maintenance of a system essential to the general well-being. This attitude has led to a fuller investigation of the facts concerned, and furnishes a central point about which they can be coördinated.

The development of a science of finance as here indicated has pointed out the contrasts as well as likenesses between the management of the money affairs of States and individuals. To both the rule of economy and caution applies equally, however great the temptation in public affairs to neglect it. By its sovereign power over the citizens, the State seems to be in a position to take all it wants. This has led to the hypothesis laid down by certain writers that in private economy expenditure is measured by income, but in the economy of the State income is measured by expenditure. The epigrammatic statement is not wholly true, since among individuals expenditures are made by inroads upon capital when income does not suffice, while in the State expenditures are sometimes curtailed and more frequently postponed for lack of sufficient income. Yet, within limits, such a contrast exists, and marks the divergent tendencies of public and of private economy.

Public Expenditure. It is through the expenditure of public money that the State works in all of its activities, and it is the first duty of the science of finance to determine their nature and scope. Finance accepts public expenditures as a fact. It is not concerned with justifying them, either in whole or in detail. Whether a given expenditure is proper is in part a question of political philosophy, in part a question of practical expediency. The former may influence general lines of policy in this respect, though in practice each proposed public expenditure is apt to be judged on its own merits. The grounds upon which such proposals are approved or rejected lie outside the domain of finance. But the fact that expenditure is made is of prime importance, and, scrutinizing the expenditures which are actually made, finance seeks, by classifying them, to arrive at the laws of their development.

Classification of Public Expenditures. Formerly economists classified public expenditures as *necessary* and *voluntary*. This classification, based upon a definite theory of the functions of the State—a subject beyond the province of finance—obviously fails to meet the requirements of modern financial theory. A fairly satisfactory classification is that of Prof. Henry C. Adams, who classes public expenditure as protective, commercial, and developmental. The first class includes the preservation of internal peace and the defense of the nation against foreign aggression. In the second class are placed expenditures entailed by the performance of a number of functions in which the State takes the place of the private capitalist, as in the management of enterprises such as the post-office, telegraphs, and railways. In the third group, developmental expenditures, are included those which the State undertakes to promote its own interests, or those of its inhabitants, such as expenditures for education and other outlays which are designed to improve general conditions among the people. It is not to be understood that the boundaries of these groups can be sharply drawn. Legislative expenses, for example, fall under all these heads. Such a classification has its value in pointing out that, besides the expenditures for protection which are essential to existence, there are others equally natural and equally unavoidable which are incident to growth and progress. The precise form which the latter take depends on local necessities and historical antecedents.

Growth of Public Expenditures. Whatever may be the theoretical justification of expenditures, however they may be appropriately grouped, finance must take cognizance of the fact that in volume expenditures are growing at a rapid rate. The evidence upon this point is cumulative, but not comprehensive. The division of authority between national and local governments materially enhances the difficulty of ascertaining the aggregate expenditures for all public purposes within a given nation. The distribution of expenditures between the national and local governments differs widely in the various countries; and for this reason it is necessary to exercise great caution in comparing the national expenditures of modern States. For national expenditures the figures are generally available. We borrow from Professor Adams a table giving the national expenditure in millions of dollars for a number of States from 1830 to 1890, to which we have added, from the latest sources, the figures for 1900:

National Expenditure in Millions of Dollars

	1830	1840	1850	1860	1870	1880	1890	1900
United States	$15	$24	$39	$63	$309	$267	$352	$590
Australia	......	......	......	40	60	100	140	167
United Kingdom	275	260	275	345	340	400	430	641
Germany	......	......	......	......	......	135	320	463
France	201	285	300	405	......	620	685	674
Russia	......	......	220	312	380	533	759	746
Mexico	......	.....	......	......	......	23	38	28
Italy	......	......	......	161	222	274	371	334
Spain	45	55	70	105	165	165	170	181
Austria-Hungary	90	140	185	225	295	375	420	604

So far as these figures go they show steady advance, though it is by no means uniformly rapid, for the various countries. The significance of this advance in national expenditure can be fully understood only by a detailed study of each of the countries involved. The first consideration is the relation of expenditure to population. For the United States this is shown by the following table, taken from the Report of the Secretary of the Treasury:

YEAR	Total mills. dolls.	Per capita	YEAR	Total mills. dolls.	Per capita
1840	$24.3	$1.42	1880	$267.6	$5.34
1845	22.9	1.15	1885	260.2	4.63
1850	39.5	1.71	1890	318.0	5.07
1855	59.7	2.19	1895	356.2	5.16
1860	63.1	2.01	1896	352.2	5.01
1865	1,297.6	37.34	1897	365.8	5.10
1870	309.67	8.03	1898	443.4	6.07
1875	274.6	6.25	1899	605.1	8.14
			1900	487.7	6.39
			1901	510.0	6.56

(Net expenditure, i. e. all national expenditures except payment of the national debt. In the nomenclature of the Treasury report 'net expenditure' includes 'net ordinary expenditure' and interest on the public debt.)

These figures show a marked difference between the period which preceded the Civil War and that which followed; they also illustrate the disturbing influence of war on the national finances. Both the earlier and the later period manifest a general tendency toward an advance of expenditure slightly more rapid than that of population. In some States, however, as, for example, Great Britain, per capita expenditures have remained nearly stationary. The most that can be said is that in recent years national expenditures have outrun the population considerably in the United States, but only slightly in Great Britain and France.

But the vital point is whether expenditure has outstripped wealth. Owing to the extreme uncertainty of all calculations of national wealth, this is a point which cannot be determined with absolute accuracy. They appear, however, to have kept pace with national wealth in France, but to have fallen slightly behind in the United States, and considerably behind in Great Britain.

Respecting local expenditure our information is less explicit. Figures cannot be presented for as many countries. In the United States we have census figures on this point up to 1890, but no investigation into local expenditure was made in the census of 1900. In 1870 local expenditures were 47 per cent. of all public expenditures, and in 1890 they had reached 61 per cent. In Great Britain the share of local expenditure rose from 34 per cent. in 1870 to 44 per cent. in 1890, while in France it rose from 21 per cent. in 1876 to 30 per cent. in 1890. This increase in local expenditures is to be accounted for chiefly by the fact that the rapidly increasing developmental expenditures fall in great part upon the local governments. To estimate their true significance for the general welfare and for the financial outlook of a nation, the expenditures should be weighed as well as measured. In general, the growth of military expenditure is to be deplored. Yet even this has its compensations, since the army, especially in some of the more eastern parts of Europe, contributes by its training in discipline to industrial efficiency. On the other hand, the increase of the developmental expenditures must, if wisely directed, be a clear national gain. The facts can only be surmised from the general statements of public expenditure which are classified statistically by administrative departments rather than by classes of expenditure. We may cite a few facts for the national expenditure of the United States, tabulated from the Treasury statements:

Expenditure in Millions of Dollars

	War	Navy	Indians	Pensions	Miscellaneous	Net ordinary	Interest	Public debt	Gross
1870.........	$57.7	$21.8	$3.4	$28.3	$53.2	$164.4	$129.2	$409.2	$702.9
1875.........	41.1	21.5	8.4	29.5	71.0	171.5	103.1	407.4	682.0
1880.........	38.1	13.5	5.9	56.8	54.7	169.1	95.8	434.4	700.2
1885.........	42.7	16.0	6.6	56.1	87.5	208.8	51.4	211.8	472.0
1890.........	44.6	22.0	6.7	106.9	81.4	261.6	36.1	332.5	630.2
1895.........	51.8	28.8	9.9	141.4	93.3	325.2	31.0	354.3	710.5
1900.........	134.8	56.0	11.2	140.9	105.8	447.5	40.1	398.7	886.4
1901.........	144.6	60.5	10.9	139.0	122.3	477.6	32.3	227.3	737.7

The nomenclature of the Treasury report is here adopted, though the interest on the public debt, a permanent charge on the revenues, might appropriately be included among the net ordinary expenditures. The table displays in condensed form some tendencies of expenditure in recent years. The fall in the interest charge is compensated by the rise of other expenditures, the aggregate ordinary expenditure here given doubling from 1870 to 1895. In this rise of 160.8 million dollars, pensions had the largest share, leaving but 47.7 million dollars to be distributed among the other items named. The combined military and naval expenditures were practically unchanged in the two years compared, while the increase fell in some degree to the Indians, but in larger measure to the miscellaneous expenditure of the Government. This growth in miscellaneous expenditure is largely for developmental functions. In times of peace a considerable part of the military expenditures, namely, the improvement of rivers and harbors, belongs to the same class. The influence of war expenditures is shown in the comparison of 1895 with 1901, when we find military and naval expenditures comprising 124.5 million dollars in an aggregate increase of 152.4 million dollars, the remainder falling again to the miscellaneous expenditure.

Comparison of National Expenditures. A comparison of the budgets of leading nations to show the place occupied in each of the several classes of expenditure is an inquiry which tempts the student, but which is confronted with well-nigh insurmountable difficulties. The most serious is the fact that while data for the finances of the several local governments are frequently missing, the distribution of functions and therefore of financial responsibility between the nation and the various subordinate governments differs greatly in the several States. This distribution rests upon constitutional provisions and administrative regulation. In comparing national budgets we find little that is common to all except the expenses of foreign intercourse, national defense, and public-debt charges. To ascertain, therefore, the proportional costs of the several items of public expenditure would require a compilation of all the expenses of all the local governments in addition to the figures for national expenditure. The lack of figures for such local expenditure renders a statistical study of national budgets, without note or commentary, valueless. The proportion of military and naval expenditure in the budgets of the Great Powers, as shown in the following table, reflects quite as much the distribution of functions as it does the importance of these expenditures:

In Millions

		Date	Debt	Military and naval	Total, ordinary
Austria-Hungary..............................	Crowns	1902	....	342.6	365.2
France..	Francs	1901	1,245.6	11,020.8	
German Empire.....	Marks	1902	88.5	639.5	1,914.9
Great Britain......................................	Pounds	1901	18.5	121.0	183.6
Russia..	Paper rubles	1900	266.9	420.1	1,555.4
United States.....................................	Dollars	1901	32.3	215.1	621.6

In Austria-Hungary the Government whose expenditures are here noted exists only for the purpose of the common defense and foreign intercourse. Russia and France as compared with the German Empire represent highly centralized countries, many of the functions performed by the several States of the latter being carried out by the central Government in the former. Again, in all the countries named, except Great Britain and the United States, the military and naval expenditure represents a peace footing.

Another obstacle to a simple comparison of national budgets lies in the varying extent to which the nations concerned undertake industrial functions. The inclusion of the postal expenditures adds 116.6 million dollars to the aggregate for the United States in 1901. In the States above compared, except Austria-Hungary, postal expenditures are included, to which the cost of operating the telegraph system is added, excepting the United States. Moreover, the French national budget is charged with the expenses of operating the tobacco, matches, and gunpowder industries, together with the expenditures due to the management of the State forests and domains and the rather limited system of State railways. The Russian budget bears the costs of operation of the alcohol and tobacco monopolies, of the railroad system, and of the State domains, which swell the aggregate expenditures of the ministries of Finance, Agriculture, and of Ways and Communication to 645,000,000 rubles. A more common illustration is offered by Prussia, where in an aggregate ordinary expenditure, by estimates of 1902, of 2431 million marks, the cost of operating domains, mines, and railways is given as 1080 million marks, a sum which is more than offset by receipts from operation, but which swells the budget in comparison with States with less varied industrial functions.

Local Expenditures. It has already been pointed out that local expenditures grow more rapidly than national expenditures, and a few figures indicative of the extent and nature of such local expenditures may be adduced. Rather than single out particular localities, it is better to have resort to the figures furnished by the census of 1890, as no general compilation of later date is available. It appeared that the expenditures for all purposes by all grades of government in 1890 were as follows:

National Government, incl. postal service	$352,218,614
States and Territories and District of Columbia, except for public schools	77,105,911
Counties, except for public schools	114,575,401
Municipalities, except for public schools	232,988,592
Public common schools	139,065,737
Total	$915,954,255

The expenditure for schools is distributed among the States, counties, and municipalities. The character of expenditure of the National Government having been already noted, we may cite from the census the following statement for local expenditure:

Legislative	$3,987,774
Executive	5,476,940
Judicial	18,721,383
Military	2,692,211
Education	145,583,115
Charities	39,958,816
Interest	46,649,136
Penal and reformatory	12,381,423
Buildings, including care and maintenance	17,950,177
Water-works and other enterprises	5,517,193
Salaries (separately reported)	37,552,655
Roads, runs, ditches, and bridges	72,262,023
New buildings (separately reported)	$34,513,020
Police	23,934,376
Public parks and places	2,962,697
Fire	16,423,820
Health	3,280,294
Lighting	11,363,780
Miscellaneous	68,041,796
Total	$569,252,629

Public Revenue. The revenues of the State are chiefly derived from taxation, but this is not the exclusive source of income. Omitting minor or casual sources of income, such as fines and gifts, the State derives a revenue from the management of its own property, from its industrial activities, and from other services which it renders to the community. Nomenclature is by no means fixed, but we may designate the sources of income as prices, charges, fees, and taxes.

(1) *Prices.*—Under the head of prices we may include the revenue arising from the sale of public property, such as land or its products. By price we mean a return fixed in the main by private competition. Such a return can be obtained when there is no monopoly of the property to be sold. Whether or not such shall be the aim of the State depends largely upon questions of public policy. As an owner of property the State is trustee for the people, and a wise policy may, in some cases, dictate the neglect of commercial interests, while in other cases it may require that they be strictly adhered to. Wherever the State has possessed large domains fitted for agricultural uses, as in the public lands of the United States and of Australia, such lands have been used rather to promote national development than to insure public revenue. Products incidental to the functions of government, such as the lumber from State forests or goods produced in penal establishments, must, if brought into the market, be sold at market prices, lest the State should injure its own citizens. The revenues from these sources are but a small portion of the income of modern States.

(2) *Charges.*—Charges may serve as a general term for the amounts paid for specific industrial services which the State performs. These include the operations of the post-office, the telegraph, the telephone, the railroad, municipal gas and electric plants, and the sale of certain products such as liquors, tobacco, matches, etc. The range of industrial activity represented, though, of course, not equally extensive in the various modern States, is varied and comprehensive. In all there is a common feature, public monopoly, which makes the term charges for public service more appropriate than prices. The determination of the charge rests upon the motives which lead the State to enter upon a specific kind of industrial activity. That motive is seldom to obtain the largest possible revenue from the enterprise, although this characterizes fiscal monopolies, such as tobacco and match monopolies, which are frequent upon the Continent of Europe. The liquor monopoly as it exists in Switzerland is not wholly fiscal in its purpose, as it seeks to eliminate some of the abuses which grow out of the private production of spirituous liquors. Far more obvious are the social interests involved in the Government management of gas and electric-lighting plants, railroads, telephones, telegraphs, and the postal service. In

the measure in which these social interests are regarded in fixing charges must the revenue-producing character of the industry be superseded. Hence the tendency under Government management to render services at cost. This is well illustrated in the history of the postal service, which in some States has ceased to be a source of net revenue. This feature should be carefully considered in all proposals for the assumption of various branches of industry by the State. From a purely fiscal point of view there is generally greater advantage in private ownership subject to taxation than in public ownership.

(3) *Fees.*—Fees are payments for definite services rendered by public authorities in the administration of public business. Such are court fees, license fees, and the like. They are based upon the theory that a special service is rendered to those who pay them over and above the general social service which the operations of government imply. As the benefit derived by the individual is intangible, there can be no question of an exact equivalence between the payment and the service rendered. The only rule which can be fixed is that they should not be so oppressive as to interfere with the orderly conduct of public affairs. Thus marriage fees, either to the State or Church, should not be so high as to promote unions not legally sanctioned. Court fees should not deprive the poorer classes of the protection of the law. Similar to fees in their nature are the taxes called *special assessments* in American finance. When a street is opened or a highway improved, while the public receives a benefit, yet the chief advantage is frequently enjoyed by the owners of the abutting real estate. For this they are compelled to pay by a special rate levied upon such real estate. Special assessments, like fees, contain therefore an element of commensurable private advantage. Unlike fees, they are levied upon real estate and are applied for the purpose of enhancing the value of that real estate. See TAXATION.

(4) *Taxes.*—In the three kinds of payment thus far discussed, there is in general a direct benefit to the individual, and the payment is only made in exchange for a direct service of the State. In this they differ radically from taxes. The latter are forced contributions to the public treasury. In practice, as in the most advanced financial theory, taxes rest upon the duty of citizens to support the State. The benefits which the citizen enjoys from the existence of government are general and not specific, and no attempt to establish a parallel between such benefits and tax payments can be successful. Writers on finance have indeed frequently attempted to justify taxation on the ground that Government renders an equivalent service in protection to person and property; but there is obviously no demonstrable relation between the payments which may be exacted from individuals in taxation and the protection afforded them. Taxes are based, then, upon the duty of citizens to support the State of which they are members; and the measure of such duty is found in their ability to bear a share of the burden. For a comprehensive treatment of the theory and practice of taxation, see TAXATION.

REVENUES OF THE UNITED STATES. In modern nations taxation greatly overshadows all other sources of revenue. This is brought out in a detailed statement of the revenue of the United States for the fiscal year ending June 30, 1901, in which the sources of income are arranged, so far as practicable, by classes.

REVENUES OF THE UNITED STATES FOR THE FISCAL YEAR ENDING JUNE 30, 1901

Prices, from sales of	
Public lands	$2,965.119.65
Indian lands	1,493,321.24
Ordnance material	703,054.42
Government property	450,698.49
Lands and buildings	236,897.53
Charges:	
Postal service	111,631,193.39
Fees:	
Consular, letters patent, land	3,414,933.49
Customs fees, fines, and penalties	711,791.43
Immigrant fund	585,082.70
License fees, Alaska	84,087.90
Taxes:	
Internal revenue	307,180,663.77
Customs	238,585,455.99
Revenues, District of Columbia	3,986,176.19
National banks	1,681,473.05
Sealskins and rent of seal islands	232,655.75
Not classed:	
Profits on coinage, bullion deposit	12,731,256.94
Navy pension, hospital, clothing, and deposit fund	1,778,454.91
Interest, Pacific railroads	1,316,516.62
Miscellaneous	841,216.03
Trust funds, Department of State	537,621.58
Soldiers' Home, permanent fund	492,623.66
Deposits for surveying public lands	247,258.90
Prize money to captors, Spanish War	217,490.60
Prize money to Navy pension fund	217,477.76
Proceeds of Arkansas bonds redeemed	85,000.00
Depredations on public lands	75,977.70
Part payment Central Pacific R. R. debt	4,576,247.10
Sale of claim against Sioux City and Pacific R. R.	2,122,841.24
Dividend for debt, Kansas Pacific R. R.	133,942.89
Total	$699,316,530.92

The foregoing statement reveals the multiplicity of Government revenues. A considerable group is not classed, though some of the items are related to the foregoing groups. Thus, all the items relative to Pacific railroad indebtedness are akin to the industrial operations of the State, as the Government subsidized in one form or another the construction of these roads. Perhaps another considerable item, profits arising from coinage operations, should be placed in the same class. It is obvious that the statement here made is one of gross revenues, for otherwise the postal service, which in the year in question was operated with a deficit of $4,954,762.21, could not figure in the table. In like manner the figures for receipts from taxation are aggregate returns without deduction of the costs of collecting the revenues, which, like the costs of the postal service, figure among the national expenditures.

RECEIPTS OF THE UNITED STATES IN MILLIONS OF DOLLARS

	Total	Customs	Int. Rev.
1840	$19.5	$13.5	......
1845	30.0	27.5	......
1850	43.6	39.7	......
1855	63.6	53.0	......
1860	56.1	53.2	......
1865	322.0	84.9	$209.5
1870	396.0	194.5	184.9
1875	284.0	157.2	110.0
1880	333.5	186.5	124.0
1885	323.7	181.5	112.5
1890	403.1	229.7	142.6
1895	313.4	152.2	143.4
1896	327.0	160.0	146.8
1897	347.7	176.6	146.7
1898	405.3	149.6	170.9
1899	516.0	206.1	273.4
1900	567.2	233.2	295.3
1901	587.7	238.6	307.2

Eliminating the postal revenue, the Government receipts were in round numbers 587.7 millions of dollars, of which customs duties and internal-revenue taxes produced 545.8 millions of dollars, or 92.7 per cent. of the total. These have been from the beginning the main dependence of the Federal Government, but they have not always occupied the same relative place. The preceding table shows the aggregate net ordinary receipts of the Treasury, and those from customs and internal revenue for selected years.

Internal taxes had been out of vogue since the War of 1812, but during the Civil War they became a more important source of revenue than customs duties. A like result followed the war with Spain, while in time of peace customs duties were the more important.

Revenues of Various Nations. The comparison of revenues of foreign countries is beset with difficulties similar to those which are encountered in comparing their expenditures. Just as there are certain unquestioned functions of national States, so there is at least one unquestioned source of national revenue, namely customs duties. But with it are found associated other forms of taxation, both indirect and direct, and other forms of income, according to the scope and variety of the functions exercised by the National Government. The most marked contrast between the United States and Great Britain on the one hand, and the Continental countries on the other, is in the extent among the latter of industrial income.

Local Revenues. As in discussing local expenditures we are forced to go back to the figures presented by the census of 1890, so we must draw our exhibit of local revenues from the same source. In the total they were distributed as follows:

National Government, incl. postal service	$461,154,680
States, Territories, and District of Columbia	116,157,640
Counties	133,525,493
Municipalities	329,635,200
Total	$1,040,473,013

The sources of local revenue are given as follows:

Ad valorem taxes on real and personal property	$143,090,574
Corporations, banks	3,153,135
" railroads	9,926,547
" other	8,758,184
Licenses, liquor	24,786,496
" other	11,144,338
Penal and reformatory institutions	3,154,520
Income from funds and investments	14,546,352
Water works and other enterprises, net	5,635,408
Sale of property	3,071,732
Fees, fines, and penalties	7,253,370
Special assessments, streets and bridges	13,196,991
" " sewers	8,254,978
Interest on deposits	986,656
Reimbursements and miscellaneous	27,870,245
Total	$284,829,526

Public Debt. A third division of the subject of finance concerns public credit and its use. As the creation of public debt often required by the exigencies of national life rests upon the public credit, a complete theory of finance must concern itself with the means by which public credit is established and maintained, as well as the methods by which it is drawn upon for the support of the public finances.

Like the credit of individuals, public credit rests upon confidence; and, like the credit of individuals, such confidence rests upon past performance of obligations incurred. Without a sacrifice of sovereignty the State can offer no other guaranty to its creditors. It is true that in certain cases the obligations of one Government have been guaranteed as to interest and principal by the Government of another State, as in the case of the Egyptian bonds guaranteed by the English Government. But in such a case the power which guarantees tends to extend its sovereignty over the Government which contracts the obligations. Again, governments have sometimes set aside the receipts from certain revenues, as, for instance, customs, for the payment of interest obligations; but without good faith this guarantee is of little value with a foreign administration of the revenues, which is again an abdication of sovereignty.

The basis of public credit is therefore the ability of the State to fulfill its contracts, and the punctiliousness with which it actually does so. Public debts are therefore bonds without mortgages or similar security. They are primarily contracts to pay interest, but may include also an obligation to pay the principal, either in whole or in part. Usually, in European countries, no fixed date is set for the repayment of public debt. A different policy is pursued by the United States. See Debt, Public.

Sinking Fund. Provision for the payment of public debt is sometimes made by the establishing of a sinking fund. A sinking fund contemplates the gradual extinction of a debt, provided by the law authorizing the debt, and while it has been discarded in the practice of the more advanced nations, is sometimes used by the nations of weaker credit. It is needless to say that the faithful fulfillment of the condition when it exists tends to support public credit. Sinking funds may assume various forms, but the principle is simple. The State guarantees an annual appropriation, as, for instance, 1 per cent. of the principal of the debt, which is used to repurchase a part of the debt in the market. The bonds so purchased are not destroyed, but are set apart in a separate fund or sinking fund, and continue to draw interest. The interest of the first year's instalment to the fund plus the second year's instalment is used to purchase bonds. By this process carried out the Government in time acquires possession of all its own bonds, which are then destroyed and the debt cancelled. This plan seems very simple and in the early part of the nineteenth century was widely adopted. Its defects are, first, that the State has not always the money available for such an appropriation; second, that it is not always expedient to purchase bonds in the market because of the premiums upon them, and third, that such a reserve of unredeemed securities can with difficulty be maintained inviolate in times of emergency. In view of these defects, sinking-fund arrangements planned in this way by statesmen like Pitt and Hamilton have never been followed to their logical conclusions. Modifications of one sort and another have been introduced which have left of the original institution little more than the name. This is shown in the history of the sinking funds in the United States, especially that of 1862. By the law of February 25, 1862, it was provided that, after the gold receipts from customs had been used to pay the interest, they were to be applied "to the purchase or payment of one per centum of the entire debt . . . to be made within each fiscal year, which is to be set apart as a sinking fund, and the interest of which shall in like manner be applied." No obligation could be more formal, yet it was not formally observed. No attention was paid to this provision after the war, and at its close the payments and purchases did not proceed in the orderly fashion prescribed by law. The surplus revenues which for a time were abundant were used for the cancelation of debt far more rapidly than had been contemplated by the law. Nor were the bonds called in or purchased retained as a fund, for by the law of July 14, 1870, it was ordered that they be canceled and destroyed, and that an amount equivalent to the interest upon such canceled bonds be paid annually into the sinking fund. In the subsequent history of the country there were epochs in which there was no debt cancelation, others in which it proceeded rapidly, just as the condition of the revenues permitted. Congress and the Treasury Department have been satisfied by the explanation that the aggregate debt reduction has been far greater than that contemplated by the law. The sinking fund to-day therefore stands practically as an expression of the policy of debt reduction, and of the authority of the Secretary of the Treasury to purchase bonds in the market for this purpose, and has no other significance. The expression occurring in our financial reports of purchases for the sinking fund means simply for debt repayment.

Whenever the financial condition of the nation warrants a repayment of debt there are simpler methods of proceeding than sinking fund arrangements. Bonds may either be called in or may be purchased in the market. Theoretically purchase in the market is preferable when the bonds are below par, but as this condition is not likely to occur in any State which has a surplus for debt payment, the case is of no practical importance. On the other hand, the terms of the contract may be such as to prohibit calling in the bonds, as has been the case in the United States, and leave no way of redemption open except purchase at a premium. In such a case the premium paid is to be compared with the saving of interest which would have to be paid during the unexpired term of the bond before redemption becomes optional. Much more suitable, therefore, for the purposes of fiscal administration are bonds which are not limited as to term of payment, but which can be redeemed at their face value at the will of the Government.

When there are no specific sinking-fund attachments to public debts, the repayment of public debt might be regarded, so far as the contract with creditors is concerned. as a work of supererogation. But just as a business man gains in credit by prompt or anticipated payments, so a policy more liberal to creditors than legal requirements demand redounds to the credit of the State. Repayment of the principal is not essential, as we have seen, to the maintenance of public credit, as States whose debt continues to increase stand in good repute, but is a policy to be recommended. Of its utility as an outlet for surplus revenues we shall speak in discussing financial policy. For conversion of public debts, see DEBT, PUBLIC.

Having considered public debt in relation to public credit, we may briefly outline its relations to fiscal operations. The creation of debt is a source of revenue which serves to equalize the difference between public expenditures and ordinary revenue. This difference may be caused by irregularity of revenue or casual deficit. Loans are then required in anticipation of revenue, and in such cases they should be temporary, of short duration, subject to redemption at will or in a brief period. If at the expiration of this period there is no accumulation of funds available for payment, the only alternatives are an extension of the loans or their incorporation in the funded debt. The difference between ordinary revenue and expenditure may be caused by a national emergency, such as war, to provide for which the ordinary sources of income, however stretched, are wholly inadequate. Or, again, the difference may be caused by the investment in great public works, which either in their effect on the general tax-producing capacity of the people, or by revenues appropriate to themselves, are expected to pay for themselves in the long run. In the cases named a resort to funded debt is the only way open by which to meet such expenditures. For a further development of these principles, see DEBT, PUBLIC.

FINANCIAL POLICY. The aim of financial policy can be summed up as the attainment of adequate revenue, a revenue adequate to fiscal needs and responsive to changes in them. This involves the questions of distribution of sources of revenue and elasticity of income.

The separation of government into national and local authorities, with the interposition of a third class of regional authorities in the case of Federal States, brings with it a division of expenditures and the need of adequate revenues for each form of government. The ideal of independence in action within their several fields can only be realized when to each are assigned certain independent sources of revenue. Without such revenues these authorities become mere disbursing offices lacking vitality. The problem of proper revenue is the most serious one which confronts the maintenance of a distribution of authority sanctioned by usage or proposed by legislation. It is a question of practical statesmanship, which must in each country take into consideration the facts of national dvelopment, and cannot be decided upon general financial or political principles.

The question at issue is partly one of law and partly one of fact. What sources of income does the law allow to the several bodies, and are these in fact suitable? In the United States the Constitution gives the Federal Government the power to collect taxes, duties, imposts, and excises, but prohibits it from imposing a capitation or other direct tax except in proportion to the population. This in fact excludes the Federal Government from the field of direct taxation, which is left to the States. Should the nationalization of railroads demanded in many quarters ever become a fact, it would withdraw from the States an important and remunerative object of taxation. Given the present functions of the Federal Government, the revenue opportunities have proved ample for its purposes.

In the States the revenue question is more perplexing. Except that they may not impose customs duties, there is no limitation upon the power of the States. But since the needs of the State governments are relatively small as compared with those of local governments, the relation of the two is of great importance. It cannot be said that there is anything like a system in the actual distribution of revenue sources between the two forms of government. It must, however, be obvious that the orderly development of each requires that well-defined sources of income be assigned in such a way as to satisfy the more rapidly increasing necessities of the local governments.

A revenue system should therefore supply current needs, should increase in productiveness as those needs increase, and should moreover be regular in its returns and capable of meeting the fluctuations of financial necessities. The customs revenue is peculiarly subject to fluctuation, and a State which relies solely upon it is exposed to serious embarrassment. This is well illustrated in the financial history of the United States, and depicted in the table of receipts of the United States, given above.

Imports on which these revenues are based follow the vicissitudes of trade, and reflect the hope or fear of tariff changes. Far more regular has been the productiveness of the internal revenue taxes imposed by the United States. To meet these fluctuations of revenue from certain sources, as well as to meet fluctuations in the need for money, the financial system of every nation needs some elastic element, some tax whose productiveness can be reduced or augmented, as the case may be. The United States may be said to have such a source of revenue in the internal revenue system. When drawn upon for the increased expenditure for the war with Spain, the effect upon the revenue was rapid and considerable. But nowhere else has this element of elasticity attained the importance which it has assumed in England, where the income tax is used for this end. In the United States it has not been necessary to increase or reduce taxation frequently, since in the past thirty years there has generally been a surplus revenue which has been applied to debt reduction.

Finance, Local. As a result of the division of authority and functions between central and local governments, a distinction is coming to be clearly drawn between general and local financial operations. The extent of the latter have been treated under the article *Finance* (q.v.); it is here necessary to emphasize some of the chief principles of local as distinguished from general finance.

Expenditures.—Those expenditures which result in purely local advantages are most naturally borne by the local government. Such, for example, are those which are incurred for local improvements and the costs of local administration. Besides these expenditures, there are some which are of general interest, but are best placed under the control of local bodies, so as to be more nearly under the supervision of the public. Examples of expenditures of this kind are those which are incurred in the support of primary education, and for poor relief and the administration of justice. It is these classes of expenditures which are increasing most rapidly. See FINANCE.

Revenue.—If local government is to possess real autonomy, it must possess independent sources of revenue. Certain classes of taxation cannot be employed by local governments. Such, for example, are the income and general excise taxes, import and export duties; taxes on bequests and inheritance. These forms of taxation are difficult to collect by local authorities; and if practice is not uniform throughout the State individuals and industries will escape taxation by shifting from one locality to another. There remain taxes on real property, and on local occupations. Neither of these objects of taxation can escape the local assessor. Franchise taxes frequently afford a considerable local revenue. Further revenues may be secured through charges for special benefits, e. g., water-rates, and special assessments (q.v.) may be employed to cover the outlay for some of the more burdensome local improvements. It remains true, however, that the revenues which can be obtained from local sources are frequently insufficient to cover the expenditures which are incurred by the local government. In many countries it has become customary to supplement local revenues by grants from the central treasury. In England, up to 1887, many grants for specific purposes were made; since that year various duties, collected by the central authority, have been marked off for local uses. In the United States the most familiar application of this principle is the grant of State funds for educational purposes.

Debt.—The local government, even more than the central authority, is often compelled to incur debts to cover the cost of undertakings which are too extensive to be paid for out of current revenues. A large proportion of local expenditures are *productive*, and should therefore be met by loans which distribute the cost over a long period. Local authorities are, however, frequently inclined to be reckless in the expenditure of resources thus gained. For this reason the central government usually exercises close supervision over the creation of local debts. In the United States, State constitutions frequently fix a limit beyond which localities cannot go in incurring debts; in many cases debt-limitation is provided in municipal charters. In Great Britain a special act of Parliament is required in order to authorize a municipal loan; and a similar practice is followed in France and other Continental countries. In England the central government acts as an intermediary in securing loans for local bodies, thus giving to the latter the advantages of the national credit; in Belgium the national treasury keeps a fund out of which loans are made to municipalities; and in Germany the funds reserved in the public treasury for the relief of invalids are loaned in this manner. See FINANCE; TAXATION; MUNICIPAL GOVERNMENT.

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FINBACK, or FINNER. A whalebone whale of the genus Balænoptera, so called because of the marked development of the dorsal fin, which in most whales is either small or wanting. They are the largest of living animals, ranging from 30 feet up to the colossal dimensions of the 'sulphur-bottom' of the Pacific, which is sometimes more than 100 feet in length. They yield little oil and the whalebone is of poor quality, so that they are not much sought after. The most common whale on the coast of the Eastern United States is a finback or razorback (*Balænoptera musculus*), which reaches a length of about seventy feet.

FINCH (AS. *finc*, Ger. *Fink;* connected with Welsh *pinc*, chaffinch, Russ. *pienka*, hedge-sparrow). The popular name of a great number of species of small birds of the family Fringillidæ (q.v.). Many of them have great powers of song, and are called by bird-fanciers 'hard-billed song-birds,' in contradistinction to the warblers (Sylviidæ), or 'soft-billed song-birds.' The name is sometimes used as equivalent to Fringillidæ; but the limits of its popular use are ill defined, and some birds are known as finches and also as linnets, or as grosbeaks, etc. The word finch often forms part of the popular name of birds of this family, as bullfinch, chaffinch, hawfinch, etc., and is almost always used with some prefix or qualifying adjective. When used as a general term applicable to the whole family, it includes those nine-primaried oscines (q.v.), with more or less conirostral bill, which have the corners of the mouth more or less sharply drawn down. The shape of the bill varies greatly; sometimes it is short and thick, sometimes comparatively slender and elongated, but it is almost always adapted to crushing seeds. Finches feed mostly on seeds and buds, but some species are more or less insectivorous. The family is a very large one, including some 550 species, which are found in all parts of the world except Australia. They are most abundant in the Northern Hemisphere, and especially in America; 135 species and subspecies occur in the United States and Canada.

Finches are nearly allied to the tanagers, weaver-birds, and American starlings and blackbirds, and it is difficult to draw any hard and fast lines between these families. The birds called buntings, sparrows, grosbeaks, linnets, redpolls, longspurs, and snowbirds are all finches, but will be treated of under these separate heads. In the United States the name finch is not in very common use, though there are some species with which it is constantly associated. The purple finch (*Carpodacus purpureus*) is a good songster, and is often called the 'linnet.' The female is plain brown, streaked with black, but the male is suffused with rich rose-red, especially deep on the head, so that he is a handsome bird. This finch and very closely allied species occur over the whole of the United States. The rosy finches, of which there are some half-dozen species, constituting the genus Leucosticte, are characteristic of the Rocky Mountain region, extending north and westward. They are seven inches or less in length, brownish or grayish in color, the males suffused with rosy red posteriorly. The grass-finch (*Poöcetes gramineus*) is more properly a sparrow, and is sometimes called vesper-sparrow or bay-winged bunting. Other well-known finches of the United States are the summer finches (Peucœa), of which half a dozen species are found in the Southern and Western States; the painted finches (Passerina), of which the indigo-bird (q.v.) is a good example; the pine-finches or siskins (q.v.); and finally the goldfinches (q.v.). See Plates of CAGE-BIRDS and EGGS OF SONG-BIRDS.

Consult Ridgway, *Birds of North and Middle America*, Part i. (Washington, 1901).

FINCH, DANIEL (1647-1730), second Earl of Nottingham and sixth Earl of Winchilsea. An English statesman. He was educated at Westminster School, Christ Church College, Oxford, and the Inner Temple; entered Parliament in 1679; became a Privy Councilor in 1680; and was First Lord of the Admiralty from 1680 to 1684. In 1682 he was called by his father's death to the House of Lords. After the Revolution he remained, in theory, loyal to the Stuarts, but formulated the well-known distinction between the King *de facto* and the King *de jure*, and gave in his adherence to the new régime. He was one of the Secretaries of State from 1688 to 1693, and again from 1702 to 1704. Both in and out of Parliament he came to be regarded as the leader of the Church party, and it was he who introduced the Toleration Act of 1689 in the House of Lords. He was a favorite of Queen Mary, and for a time enjoyed to some extent the confidence of Queen Anne, but incurred the latter's displeasure by urging that the Electress Sophia be invited to live in England. From 1714 to 1716 he was president of George I.'s council. In 1721 he wrote *An Answer to Mr. Whiston's Letter Concerning the Eternity of the Son of God.* He is the subject of Dean Swift's famous ballad, "An Orator Dismal of Nottinghamshire."

FINCH, FRANCIS MILES (1827—). An American poet and jurist. He was born at Ithaca, N. Y., and graduated at Yale in 1849. He studied law and began to practice at Ithaca. He was a collector of internal revenue during Grant's first administration, and in May, 1880, was appointed a judge of the New York Court of Appeals, to fill a vacancy. In the fall of 1881 he was elected to the same bench for a full term of fourteen years. He took a prominent part in the organization of Cornell University, was a member and secretary of the board of trustees for many years, and in 1892 became dean of the law school. His literary work, which is extensive and of unusual merit, consists largely of poems, among the best known of which are "The Blue and the Gray" (1867) and "Nathan Hale" (1853).

FINCH, HENEAGE. See NOTTINGHAM.

FINCH'LEY. A municipality of Middlesex, England, and a northern suburb of London, four miles south of Chipping Barnet (Map: London, C 6). Population, in 1891, 16,600; in 1901, 23,600.

FINCK, fĭnk, FRIEDRICH AUGUST VON (1718-66). A Prussian general, born at Strelitz. He successively served in the Australian, Russian, and Prussian armies, and was appointed adjutant-major to Frederick the Great. In 1759 he was promoted to be lieutenant-general, in which capacity he displayed great ability. Detailed by Frederick the Great to assist Prince Henry in the defense of Saxony, he compelled Field-Marshal Daun to retreat, but expostulated with the King when told to pursue the Austrian general. He followed Daun as far as Maxen, where he was attacked by an overwhelming body of the enemy and compelled, after a brave defense, to surrender, with his entire force. Although personally blameless, he was nevertheless condemned by the military tribunal to be expelled from the army and to be imprisoned in a fortress for two years. In 1764 he entered the service of the King of Denmark. He died at Copenhagen.

FINCK, Henry Theophilus (1854—). An American musical critic, born at Bethel, Mo. A few years after his birth the family removed to Portland, Ore. There he studied piano and violoncello, and taught himself Latin and Greek so thoroughly that he was able, in 1872, to enter the sophomore class at Harvard, where he devoted himself chiefly to philosophy, the classics, and music, the last under Prof. John K. Paine. In 1876 he attended the Bayreuth Festival, of which he wrote accounts for newspapers and magazines. A subsequent fellowship from Harvard enabled him to spend three years in study in Berlin, Heidelberg, and Vienna. In 1881 he became musical editor of the New York *Evening Post,* and entered upon his long and uncompromising propaganda for Wagner's music, becoming the leading American advocate of that composer's theories. His writings include: *Romantic Love and Personal Beauty* (1887); *Chopin, and Other Musical Essays* (1889); *Pacific Coast Scenic Tour* (1890); *Spain and Morocco* (1890); *Wagner and His Works* (1891); *Lotos Time in Japan* (1898); *Primitive Love and Love Stories* (1899); *Pictorial Wagner* (1899); *Anton Seidl* (1899); and *Songs and Song Writers* (1900).

FINCKENSTEIN, fĭn̲k′*e*n-stīn, Karl Wilhelm, Count Finck von (1714-1800). A Prussian statesman. He was a son of Count Albrecht Konrad Finckenstein, Field-Marshal of Prussia, and preceptor to the Crown Prince, afterwards Frederick the Great. He was educated at Geneva, and was subsequently appointed Ambassador to Stockholm, where he remained until 1740. Frederick the Great, upon his accession to the throne, successively sent him as Ambassador to Denmark (1740-42), England (1742-44), and Stockholm (1744-46). He was Ambassador to Russia from 1747 to 1749, and upon his return was appointed member of the Cabinet. In this capacity he became one of the chief advisers of Frederick, who corresponded with him throughout the Seven Years' War, and sent to him the celebrated secret instructions dated January 10, 1757. Until 1763 he conducted the foreign affairs of the kingdom, and in June, 1799, celebrated his fiftieth anniversary as Minister.

FIN DE SIÈCLE, făɴ d*e* sē̇-å′kl′ (Fr., end of the century). A phrase that became popular in Paris in 1889 and then made its way into the vocabulary of all other countries, as a jesting way of qualifying anything novel, surprising, piquant, or decadent. When the twentieth century began the phrase was dropped, and anything especially piquant was described as *vingtième siècle.*

FINDING (from *find,* AS. *findan,* Icel. *finna,* OHG. *findan,* Ger. *finden,* Goth. *finþan,* to find). (1) A qualified source of title to goods and chattels at common law. It is true the loser is not divested of his title to his goods when they pass by finding into the hands of another, but he may reclaim them until his right becomes barred by the statute of limitations; but the finder acquires what is known as a 'special property' in them, which is available to him against all the world except the true owner. Before appropriating them to his own use, however, he must use every reasonable means to discover the owner. It has been decided that if the property had not been designedly abandoned, and the finder knew who the owner was, or knew that he could have discovered him, he was guilty of larceny in keeping and appropriating the articles to his own use. (See Derelict.) In some jurisdictions the finder is by statute entitled to a lien on the property for the necessary expenses of preserving it and discovering its owner. As between the owner of land in which lost or secreted chattels are discovered and the finder, the former has the better title. But if the articles are found in a shop, hotel, or other public place, the finder is entitled to them as against the possessor of such place. If goods are improperly withheld by the finder, the common-law remedy of the rightful owner is *detinue* (q.v.). In many of the United States statutory remedies have been provided not differing essentially from the common-law procedure. See Derelict.

(2) The technical designation of the formal statement of the conclusion reached by a trier of an issue of fact. It is called a general finding when it disposes of the entire case. If it is a statement of particular facts, to which the law is thereafter to be applied by the court, it is known as a special finding. The refusal of a court or referee to make a finding concerning a material fact with respect to which evidence has been given constitutes an error of law, entitling the injured party to relief from an appellate court. The finding of a court, referee, or jury when the evidence is conflicting is rarely disturbed on appeal; but a finding without any evidence to support it will be set aside. See Appeal; Court; Jury; Trial; and authorities cited under the last three titles.

FINDLATER, fĭn′l*a*-tẽr, Andrew (1810-85). An English compiler. He was born at Aberdour, Aberdeenshire, and graduated at the University of Aberdeen. He began his connection with the publishing firm of Messrs. Chambers of Edinburgh in 1853, and subsequently became editor of their *Encyclopædia,* to which he was a contributor. Among the scientific manuals prepared by him for the firm the handbook on philology is regarded as especially meritorious.

FIND′LAY. A city and county-seat of Hancock County, Ohio, 44 miles south of Toledo; on the Blanchard River, and on the Toledo and Ohio Central; the Cincinnati, Hamilton and Dayton; the Cleveland, Cincinnati, Chicago and Saint Louis; the Lake Erie and Western, and other railroads (Map: Ohio, C 3). It is the centre of the oil and natural-gas fields of Ohio. In the vicinity are beds of clay, stone for building, and lime, and deposits of sand and gravel. The manufacturing establishments are numerous, and include glass-factories, brick and tile works, foundries and machine-shops, rolling-mills, boiler-works, bridge-works, target-works, potteries, oil-refinery, furniture, carriage, and nail factories, limekilns, etc. Findlay College (Church of God), opened in 1886, is situated here, and there are a public library, a city hospital, and an orphans' home. Settled in the early part of the nineteenth century, Findlay was first incorporated in 1837. The government, under a revised charter of 1890, is vested in a mayor, chosen biennially, and a city council which elects, or confirms the executive's nominations of, the majority of administrative officials. The city solicitor, water-works and cemetery trustees, and board of education are chosen by popular vote. The city owns and operates its water-works. Population, in 1890, 18,553; in 1900, 17,613.

FINE (OF., Fr. *fin*, from Lat. *finis*, end, supplementary payment, fine). A form of conveyance of lands at common law through the medium of a fictitious suit. A fine is defined by Coke as "an amicable composition and final agreement by leave and license of the King or his justiciaries;" and it was called a fine because it put a termination (*finis*) to all litigation between the parties, and those claiming through them, in regard to all matters touching the suit. The proceedings in a fine were shortly as follows: The party to whom the land was to be conveyed commenced a fictitious suit against the vendor. But the case was no sooner in court than the plaintiff asked leave to agree or settle with the defendant. This leave having been obtained, a covenant was entered into whereby the vendor or defendant, called the *cognizor*, recognized the right of the plaintiff, called the *cognizee*, to the lands, of which he admitted that the plaintiff was wrongfully kept from the possession. These proceedings, which at first were real, were afterwards adopted universally without having a shadow of foundation in fact. The solemn farce having been completed, a *note* of the fine, being an abstract of the covenant, the names of the parties, and the parcels of the land, was entered on the rolls of the court; and the business was concluded by what was called the *foot* of the fine, setting forth the parties, the time and place of agreement, and before whom the fine was levied. The whole was embodied in indentures commencing *hæc est finalis concordia*. It was necessary that a fine should be levied openly in the Court of Common Pleas, or before the Chief Justice of that court, or before two or more commissioners, duly appointed. In order that a fine should have full effect, it was required to be levied with *proclamation*, i.e. open proclamation of the transaction in court. A fine so levied cut off the right even of strangers who failed to assert their claim during the period allowed by law; hence an estate was said to be barred by fine and non-claim. A fine levied by a married woman had the effect of cutting off all right she might have in the lands, and was the only mode by which a married woman could convey her lands or her dower right in her husband's lands. Like the feoffment and the common recovery (q.v.), a fine was known as a tortious conveyance; that is, it had the extraordinary operation of conveying whatever estate it purported to convey, irrespective of whether the vendor was seised of the estate conveyed, or had any right to transfer it. The effect of such a tortious conveyance was to vest a defeasible title in the vendee, leaving the person entitled to the possession to pursue his remedy by entry or appropriate action.

The practice of conveying lands by fine, as well as the process of common recovery, was abolished by the Fines and Recoveries Act, 3 and 4 Will. IV., ch. 74. Both of these modes of conveyance were in use in the Colonial period of American history, but have become obsolete or have been abolished by statute. The fine was recognized and confirmed by legislative act in New York, and was not done away with until 1830. See CONVEYANCE.

FINE. In criminal law, a pecuniary mulct or punishment imposed by a competent court upon an offender convicted of a crime or misdemeanor. The term came into use in England during the reign of Edward I., when it became common for a court to sentence a culprit to a short term of imprisonment and then to allow him to "make fine," that is, to make an end (*finem facere*) to his imprisonment by paying into court a certain sum of money. At the outset this was considered a sort of bargain to end his imprisonment, and not as an infliction of a pecuniary penalty, as the judges desired to avoid the possibility of the practice being confused with that of amercement (q.v.), which must be fixed by the assessment of the offender's peers.

The practice of allowing a culprit convicted of a trivial offense thus to have his option of fine or imprisonment prevails to a large extent at the present time. This is true especially in the punishment of misdemeanors, the penal statutes usually prescribing as the punishment a short term of imprisonment or a moderate fine, in the discretion of the court. In the less aggravated cases the magistrates usually impose the fine, but if the culprit is unable to pay the amount he is remanded to prison, and a certain amount of his fine is considered as discharged for each day of confinement. For example, in New York if a magistrate imposed a fine of $10, on default of payment the culprit would be confined in a penal institution for ten days, his fine being considered as reduced $1 each day. It is provided in the United States Constitution (Eighth Amendment) that "excessive bail shall not be required nor excessive fines imposed." This does not set any definite limitation on the power of Congress to impose such pecuniary penalties as may seem expedient, but it affords grounds for attacking the constitutionality of a statute which seems oppressive in this particular, and thus makes the legislative act subject to review by the courts, which is our great safeguard. Many of the States have inserted similar provisions in their constitutions. See AMERCEMENT; FORFEITURE; PENALTIES.

FINE, fēn, or **FINÉ**, fē'nā', ORONCE. See ORONTIUS FINEUS.

FINE-EAR. A servant of Fortunio, in the fairy tale *Fortunio*, who could hear the grass or a sheep's wool grow.

FINET'TA. A fairy tale, by the Comtesse d'Aulnoy (1682). It is only a slightly altered version of *Cinderella*.

FINGAL, fiŋ'gal. The name of the hero in Macpherson's *Poems of Ossian*. (See MACPHERSON, JAMES.) It represents an original Gaelic *Fionn Gaidheal*, 'Finn the Gael,' and appeared as *Fionnghael* in the 1763 edition of *Temora*. But in the collected edition of Macpherson's Gaelic texts (1807) the spelling is regularly *Fionnghal*. In all genuine Ossianic literature the name of the leader is simply *Fionn* (earlier *Finn*), but this regular form occurs very rarely in Macpherson.

FINGAL. Another, but unauthorized, name for the Gaelic hero Fionn MacCumhail (q.v.).

FINGAL'S CAVE. See STAFFA.

FINGER. See HAND.

FINGER-AND-TOE DISEASE. See CLUBROOT.

FINGER-BOARD (AS. *finger*, Icel. *fingr*, Goth. *figgrs*, OHG. *fingar*, Ger. *Finger*, finger + *board*). In stringed musical instruments, the thin strip of wood glued upon the neck, above which the strings are stretched and on which the player presses his finger when shortening the strings. At its lower end the finger-board projects over the sounding-board of all instruments played with the bow, but in other varieties, as in the guitar, it is glued down on both neck and sounding-board. In some stringed instruments plucked with the fingers the finger-board is divided by frets to enable the player more readily to find the correct pitch. See KEYBOARD.

FINGERING. In music, the method of applying the fingers to the keys, holes, strings, etc., of musical instruments. The simplest fingering is upon the brass wind-instruments, whose keys are so few that they can be manipulated by one hand without change of position. The wood-wind instruments come next in order of difficulty, various functions being assigned to each finger, and sometimes the same key being pressed by different fingers. For the fingering of stringed instruments, such as the violin, see POSITION. The most complicated fingering, however, is on instruments having keyboards. The method of notation for fingering used at present on the pianoforte in which the thumb is marked × and the fingers 1, 2, 3, 4 (English); or the thumb 1, and the fingers 2, 3, 4, 5 (German), is the outcome of a long series of experiments, prominent among the reformers being Liszt, Tausig, and Bülow. Consult: Whittingham, *Companion to All Instruction Books for Keyed Instruments* (London); Reinagle, *A Few Words on Pianoforte Playing, with Rules for Fingering* (London, 1854); Cramer, *Studies for the Pianoforte* (New York, 1828). See also articles on the various instruments.

FINGER-SPONGE. See GLOVE-SPONGE.

FINGER SYMBOLISM. A representation of numbers, common in the Middle Ages. Since only one number could conveniently be represented at one time upon the abacus (q.v.), it is possible that the finger symbolism was invented to enable the calculator to hold in mind the numbers with which he was working. Nicolaus Rhabdas of Smyrna, a mediæval Greek (fourteenth century), describes the finger symbolism in use in his time and long before; thus, 80 was represented by laying the thumb of the left hand upon the palm, bending the forefinger closely over the first joint of the thumb, and slightly bending the remaining fingers. See Gow, *History of Greek Mathematics* (Cambridge, 1884). For the work of Rhabdas, consult *Notices et extraits des manuscrits de la Bibliothèque Nationale*, vol. xxxii. (Paris, 1886).

FIN′IAL (from Lat. *finis*, end). An ornament executed in the round, generally carved to resemble foliage, and forming the upper termination of peaks, pinnacles, gables, spires, and other pointed structures. Finials are found in many different styles; in Greek architecture, in the exquisite choragic monument of Lysicrates and works of similar form (see ACROTERION); in Roman architecture, on the summit of the Pantheon and the temple at Tivoli; in Chinese architecture, over pagodas and pavilions; in Mohammedan architecture, over domes and minarets, and in similar positions in Christian monuments; but it was not until the twelfth century that the finial proper was developed. During the latter part of that century and the whole of the thirteenth century, finials of the most perfect form and of infinite variety were used as the crowning ornaments of every salient point in the buildings of the period, and as one of the special features of the Gothic decorative system throughout Europe. The architects of the fourteenth century in finials, as in other ornaments, imitated more closely the forms of natural foliage; but their finials had neither the variety of design nor the vigor of outline of those of the preceding century. In the late Gothic of the fifteenth and sixteenth centuries, the finials became more and more meagre in form, and are frequently only four crockets set upon a bare pyramidal terminal. Some variety of effect is often obtained during this period by surmounting the finial with a gilded vane. Finials were carved both in stone and in wood, and in the latter material with great delicacy and minuteness. In connection with metal-work, finials of metal were used, and whatever the material adopted, its natural capabilities were made a source of special beauty.

The finial had no place in the system of Renaissance architecture, and was used only when a mixed style prevailed, as in Germany and England. We thus find in Elizabethan architecture a variety of finials; they are, however, almost entirely of a geometric form and without foliage, and are frequently, especially when terminating wooden gables, combinations of finial and vane, partly wood and partly iron. In the strict classic, the only traces of the finial are in the balls, obelisks, etc., used as terminations, and also in the shields and supporters (themselves a remnant of feudalism) which form the crowning ornament of gate-piers, pedestals, etc., and which really correspond more closely to the ancient anthemion terminations.

FINIGUERRA, fē′nê-gwĕr′rȧ, TOMASO. An Italian goldsmith of the fifteenth century, born in Florence, and also called 'Maso.' He is presumed to have been a pupil of Lorenzo Ghiberti, whom he assisted in his work on the doors of the Baptistery in Florence. Finiguerra has been said to have been the inventor of engraving on metal, but this statement cannot be received as truthful in view of the evidence that engraving originated with the Germans. Vasari says it was discovered accidentally by Finiguerra. While he was using liquid sulphur on silver plate, the line of his graver became filled with black, and when the sulphur was removed a distinct drawing remained. There are several of his plates in the Cabinet of Prints, in Paris, and the sulphur print Vasari mentions is in the British Museum. Benvenuto Cellini speaks of Maso's skill in enameling.

FINING (from *fine*, OEng. *finen*, to refine, from *fine*, pure, from OF., Fr. *fin*, from Lat. *finitus*, p.p. of *finire*, to end, from *finis*, end), or CLARIFICATION. The process by which turbid liquors such as beer or wine are clarified or made clear. The simplest method of fining is by passing a liquid through a porous substance, such as charcoal, a cloth, or filtering paper, which retains the solids and allows the clear fluid to pass through, but this method can be used only with those liquids that contain matter that is mechanically suspended in them. Such liquids as contain mucilaginous or other gummy matter that readily clogs the filter require special means of separation. The fact that the albumen of meat coagulates the mucilaginous material in soup has been taken advantage of for the purpose of fining.

In the fining of syrups and such liquors as may be heated without injury, a soluble albumen such as the white of egg may be used. To a small portion of the turbid liquid albumen is added, and after thorough mixture the portion is poured into the rest of the liquor and agitated. On the application of heat the albumen coagulates and contracts into scum that envelops and draws together the suspended matter, which may then be readily removed. As albumen is coagulated by alcohol, it may be used for fining wines and cordials without the application of heat. Malt liquors, on the other hand, are fined by means of gelatin, as isinglass. Thus one pound of isinglass may be soaked in three or four pints of water or sour beer to which, as the isinglass swells, more sour liquor is added, until it measures a gallon. The resulting jelly is then dissolved in seven or eight gallons of liquor to be fined, and this solution, called 'brewer's finings,' which has the consistency of syrup, is used in the proportion of a pint to a pint and a half to a barrel of ale or porter, or to a hogshead of wine. The isinglass combines with the astringent matter of the liquor, forming an insoluble solid which sinks to the bottom and carries with it the suspended matter, where it is allowed to remain, as the flavor of malt liquors depends somewhat upon the astringents they contain. For the fining of spirits a proper proportion of alum is added to the liquor and then a solution of sodium carbonate, and after agitation in the presence of air, the spirit is allowed to rest for twenty-four hours, after which it will be found to be clarified. Frequently salts are used for fining; thus acetate of lead is sometimes added to the liquor, and then, after thorough agitation, a solution of potassium sulphate. In this case an insoluble lead sulphate is precipitated, which carries down with it the gummy material. This process is objectionable, as lead salts are poisonous. Ox-blood is sometimes used as a substitute for albumen. The best liquors need no artificial fining, as they clarify themselves, for the turbid matter sinks to the bottom soon after the fermentation is completed, and much care must be exercised in the use of finings, especially in cases where the liquors require a certain amount of astringency, briskness, and piquancy, as these qualities are diminished and the liquor is likely to become flat and vapid. Those liquors which fail to become clear when treated with finings in the usual manner are called 'stubborn.' Consult Gardner, *Brewer, Distiller, and Wine Manufacturer* (London, 1883).

FINISTÈRE, fē'nĕ'stâr' (Lat., *finis terræ*, 'land's end'). The westernmost department of France (q.v.), comprehending a part of the former Duchy of Brittany (Map: France, B 3). Area, 2595 square miles. Population, in 1896, 728,590; in 1901, 773,014. It is traversed from east to west by two low but picturesque chains of hills. Its coast is rugged and broken, its shores bristling with dangerous granite rocks, and fringed with many islands. The soil, one-third of which is occupied by sandy tracts and marshes, is moderately productive. Corn, hemp, and flax are grown in considerable quantities. The silver and lead mines are valuable, those of Poullaouen and Huelgoat being about the richest in France. Its principal rivers are the Aulne, the Laita, and the Odet. Capital, Quimper. Brest is in this department.

FINISTER MOUNTAINS. A range of mountains in Kaiser Wilhelms Land (q.v.). They reach an altitude of 11,315 feet.

FINISTERRE, fĕ'nĕ'stâr', CAPE. See CAPE FINISTERRE.

FINK, LOUIS MARIA (1834—). An American prelate, born at Triftersberg, Bavaria. He was educated at Ratisbon, came to the United States in 1852, was ordained priest of the Roman Catholic Church in 1857, and was stationed at Bellefonte, Pa., Newark, N. J., Covington, Ky., and Chicago, Ill. In 1871 he was consecrated titular Bishop of Eucarpia, and appointed coadjutor to Bishop Miege, Vicar Apostolic of Kansas. He was transferred to the Diocese of Leavenworth in 1877.

FIN'LAND (Fin. *Suomesimaa*, land of lakes and marshes). A grand duchy of Russia, extending from about latitude 60° to about 70° N., and lying between longitudes 20° 30′ and 33° E. (Map: Russia, C 2). Its extreme length is 700 miles from north to south. The greatest breadth is about 400 miles. Finland is bordered on the north by Norwegian Lapland, on the east by Russia proper, on the south by the Gulf of Finland, and on the west by the Gulf of Bothnia and Sweden. It includes part of Russian Lapland. It has an area of 142,000 square miles, of which about 35 per cent. is forest (including many moors and morasses); over 11 per cent. is occupied by lakes; about 3 per cent. is arable; and about 5 per cent. is in meadow. Finland has been called the 'Land of the Thousand Lakes.' Among its largest lakes are Kalla, Piäyänne, Enare, Torneå, Hauki, and Saima. The last of these, about 180 miles long, is the centre of the system of water communication between the central part of the country and the Gulf of Finland. Lake Ladoga indents the southeast corner. The surface of Finland in general is a tableland rising from 400 to 600 feet above the level of the sea, with occasional elevations reaching about 2000 feet. In the extreme northwest an altitude of about 4100 feet is reached in Haldischok. The rivers are unimportant, the chief being the Muonio, which flows between Finland and Sweden, the Kemi, and the Uleå. The coastline is generally low, skirted in the south by numerous rocky islands.

The Crown forests are extensive, yielding the Government a considerable income. The forest trees are mainly conifers. Oaks and other broadleaf trees are found in the southern portion. In the northern section the vegetation is that of the Arctic tundras. The chief mammals are bears, wolves, lynxes, gluttons, foxes, elk, and reindeer. Game-birds and water-fowl abound, as well as fish, principally herring and salmon.

CLIMATE. The climate of Finland is rigorous but healthful, marked by long winters and short but hot summers. It lies within the zone of cyclones and anti-cyclones, which pass over northern Europe from west to east at intervals of two or three days throughout the year, and give variability to the winds and weather. The mean annual temperature varies between the southern and the northern boundary from 40° F. to 34° F., ranging from 20° F. to 8° F. in January, and from 64° F. to 62° F. in July. The extreme range of temperature is about 110° to 115° F. The prevailing winds in winter are from the south and southwest, and in summer from the north, northwest, and west. The amount of rainfall varies from 10 inches in the northern to 25 inches in the southern part, being greatest during August. The degree of cloudiness varies from 50 per cent. at the south to 72 per cent. at the north.

GEOLOGY AND MINERAL RESOURCES. In its geological structure Finland is closely related to the Scandinavian Peninsula. Granite and Archæan rocks predominate, overlain by glacial materials. The granite is extensively quarried for building-stone. Bog-iron ore and copper are the only metallic minerals of importance. The former occurs in marshes and in the numerous lakes, while the copper-mines are located at Pikäranta on Lake Ladoga.

AGRICULTURE. Owing to the northern situation and the very limited cultivable area, as well as the primitive methods employed, Finland's home supply of agricultural products falls far short of the demand. In 1896 the number of land-holdings was 117,704, of which 2694 embraced over 250 acres each, and 32,162 less than 12½ acres. In other words, the proportion of large landholders is small. The influence of the landed aristocracy as a class, once considerable, has greatly waned since the law of 1863-64, which enables every citizen to buy tax-exempted land from the nobility. There are 70,000 tenants, partly on private and partly on Government land. The State owns about one-third of the whole area, and rents land on very advantageous terms, giving lessees every reasonable opportunity for purchase. Rent of private lands is paid mostly in labor. Though the laws governing the relations between tenant and landlord leave much to be desired, the condition of tenants was perhaps better during the last century than that of the average in the countries of Europe. After Finland became a Russian duchy, its agriculture underwent a significant change. Owing to the excess of pasture over arable land, the dairying industry has always been more or less important, but prior to 1850 agriculture in Finland meant chiefly the raising of rye, corn, oats, barley, and potatoes. Since then dairy products have become more prominent, and the use of machinery in their production, introduced by the example of owners of the larger estates and followed by the coöperative societies, is now very general. Finland exports annually about $6,000,000 of animal products, chiefly butter. The live stock of the country in 1899 numbered 308,486 horses, 1,457,423 cattle, 1,031,185 sheep, 214,206 swine, 119,917 reindeer, and 9083 goats. In the development of its fisheries, as well as of its live-stock interests, the country has greatly advanced.

MANUFACTURES. Naturally Finland is not favorably situated for manufacturing, although the numerous streams offer an abundant supply of power. During the period of 1887-98, however, the number of manufacturing establishments grew from 5615 to 7787 (39 per cent. gain); the number of workmen employed increased from 43,085 to 91,055 (111 per cent.); and the value of products, exclusive of flour, rose from about $22,500,000 to about $56,700,000 (150 per cent.). The chief manufactured products are lumber and wooden articles (about 25 per cent.), iron products, mechanical appliances, etc. (15 per cent.), textiles (12 per cent.), paper (10 per cent.), leather (7 per cent.). By far the leading export is timber, the value of which for 1900 was about $22,780,000.

COMMERCE AND TRANSPORTATION. Respecting commerce Finland has been practically independent of Russia. The Finnish manufacturer gets his material much cheaper than the Russian, hence has been able to compete with the latter even in the Russian market. The great difference between the prices on certain manufactures in Finland and in Russia has led to extensive smuggling. These difficulties, however, are being rapidly overcome under the measure instituted by the Czar in 1897, which provides that all articles of Russian origin, except spirits, sugar, salt, tobacco, and beer, are admitted free to Finland; all agricultural and hand-made articles from Finland are passed free into Russia; all products of the principal industries are liable to differential duties; the remainder are treated in the same way as foreign products. Finland's annual imports increased during 1890-1900 from $28,120,000 to $54,151,000, and its exports from $18,480,000 to $39,546,000. The imports comprise chiefly foodstuffs, metal products, and textiles. About 15 per cent. of the exports consist of animal products, mostly butter, and about 60 per cent. of wood products, including paper and pulp. The trade is mainly with Russia, Germany, Great Britain, Denmark, and Sweden, named in the order of their importance. The transportation facilities are fully adequate to the demands of the country. Its even surface greatly facilitates the construction of common roads, of which there are over 30,000 miles. The numerous lakes are utilized freely for transportation, and, joined by short canals, they afford continuous waterways. The first railway in Finland was completed in 1862—a line of about 88 miles between Helsingfors and Tavastehus. In 1900 there were about 1800 miles, of which only about 170 miles were owned by private companies. The State lines are well managed, and their income forms an important item in the budget.

FINANCE AND BANKING. The budget of Finland reached the sum of $17,500,000 at the end of the nineteenth century. The largest expenditures were for public works (mainly railroads), administration and service of the debt, worship and education, and military affairs. The income usually exceeds the expenditures by from $4,000,000 to $5,500,000. The public debt, contracted exclusively for railway construction, amounted at the beginning of 1901 to about $22,300,000, held mostly at 3 and 3½ per cent. interest. Finland has a gold standard, and the unit of value is the mark or markka, equivalent to 19.3 cents, the same as the French franc. The chief financial concern is the Bank of Finland, a State institution established in 1811, and by means of which most of the financial undertakings of the State are carried out. The first savings bank was established in 1823. In 1898 there were altogether 174 savings banks, mostly private, but under the supervision of the State, with 124,254 depositors, and deposits amounting to 75,139,173 marks, or about 28 marks per inhabitant.

Government. The position of Finland in the Russian Empire was until recently that of a dependency, with its own constitution, and practically autonomy in its internal affairs, all diplomatic relations, however, being carried on by the Empire. The executive department consists of the Senate (which meets at Helsingfors), whose members are nominated by the Emperor (the Grand Duke of Finland), the Governor-General, and the State's Secretariat for Finland at Saint Petersburg. The national Diet is composed of nobles, clergy, burghers, and peasants. The Finnish Army, according to the provisions of the defense law of 1878, could not be required to serve outside of Finland, and was under the command of Finnish officers. The autonomy of Finland has, however, been practically suppressed by the Emperor, his policy being calculated to reduce the country to the condition of a Russian province (see *History* below). The Diet, while permitted to go through the forms of legislating and of treating with Russia, has really been robbed of its rights. The Czar has assumed the rôle of supreme ruler, communicating his sovereign will by means of edicts.

Population and Religion. The population of Finland numbered 2,060,782 in 1880, 2,380,140 in 1890, and 2,673,200 in 1899, or about 19 per square mile. The females exceeded the males in 1899 by about 30,024, and the urban population formed only about 11.2 per cent. of the total. The chief cities and their populations (1897) are: Helsingfors (the capital), 88,711; Åbo, 36,898; Tammerfors, 34,148; and Viborg, 25,235. As regards religion, in 1899 there were 2,620,891 Lutherans, 48,812 Greek Orthodox, 2620 Baptists, 560 Roman Catholics, and 300 Methodists. The language of the country is Finnish, although Swedish is spoken by the higher classes, in addition to the Swedes, who form about 13 per cent. of the population. The Russians number but a few thousand. See Finns.

Education. In accordance with the Russian movement in Finland, the Imperial authorities have practically taken charge of the Finnish school system with the purpose of supplanting the native language and learning by the Russian. Finland is well known for its literacy, but now that the Imperial Government, which has never been very kindly disposed toward education, has taken summary control, the native school system is entering upon a doubtful future. Evidently it will not be long before Russians will supplant Finns as schoolteachers. Already a Russian has been appointed chancellor of the famous university of Helsingfors. This university is at the head of the Finnish educational scheme. It was founded at Åbo in 1640 and transferred to Helsingfors in 1827. In 1900 it had an attendance of 2318, of whom 354 were women. There were 50 lyceums in 1899. Primary instruction is furnished by public, parochial, and traveling schools. According to the school census of 1896, out of 457,678 children of school age only 18,771 received no education. The public schools are maintained largely by local funds, but receive a subvention from the Government. Finland has a large number of periodicals, and not a few learned societies.

History. The Finns are said to have dwelt on the Volga in the seventh century, and to have been driven northward at the beginning of the eighth. The true Finns call themselves Suomi. In the twelfth century the Swedes, zealous for the extension of Christianity, and perhaps also ambitious for the expansion of Swedish power, began the long struggle which ended in the closing years of the thirteenth century in the Christianization of the people and their subjection to Swedish sovereignty. Henrik, the English-born Bishop of Upsâla, who accompanied the first Swedish expedition in 1157, was murdered by a Finn and became Finland's patron saint and martyr. For over five hundred years Finland remained an appanage of the Swedish crown. Gustavus Vasa (q.v.) introduced the Lutheran religion in 1528, and John III. made the country a grand duchy. Under Swedish rule the people enjoyed an autonomous constitutional government, and developed a simple, intelligent, and unique civilization. While Finnish remained the language of the peasantry, Swedish became that of the towns and of the cultivated and official classes. During the long wars between Russia and Sweden Finland was frequently a battleground, and as the Finnish frontier is only thirty-three miles from Saint Petersburg, it was naturally desired by the former country to round out its territory and complete its defenses. This desire was realized in the Peace of Frederickshamn, September 17, 1809, following upon a Russian invasion, by which Sweden ceded the grand duchy with the Arland Islands to Russia. Alexander I. (q.v.) guaranteed to Finland the preservation of its laws, constitution, and religion, and this pledge has been solemnly renewed to the Finnish estates by each of his successors, including the present Czar. In 1898, however, Nicholas II. began the series of measuses which have since been slowly put in operation looking to the Russification of Finland, in common with other provinces of the Russian Empire. The army law, which was to change the army from a purely national force for purposes of defense to an integral part of the Russian Army and make it a heavier burden, received a check in February, 1901, in the form of a heavy adverse vote in the Russian Council of State, but this served merely to retard the process of Russification for a very brief time. In October, 1902, a series of ordinances was promulgated, aiming at the complete destruction of Finnish autonomy. The Senate was placed under the control of the Governor-General, who, under the new conditions, exercises the virtual power of dismissal over all administrative officials, as well as over the judges of the law courts. To secure immunity for the Russian bureaucracy in their attack upon the liberties of the people, it was provided that no official, however humble, could be brought to trial without the consent of his superior. Before this Russian had been made the official language, and a rigid censorship had resulted in the suppression of a number of Finnish journals.

Consult: Michelin, *Finland im 19ten Jahrhundert* (Helsingfors, 1894); Tweedie, *Through Finland in Carts* (London, 1897); *Statistisk Arbok för Finland* (annual, Helsingfors); Barnhak, *Russland und Finland* (Leipzig, 1900); *The People of Finland in Archaic Times* (London, 1892); Koskinen, *Finnische Geschichte* (Leipzig, 1873); Ignatius, *Le Grand-duché de Finlande* (Helsingfors, 1878); Jonas, *Das Grossfürsten-*

tum Finland (Berlin, 1886). For Finland's relations with Russia, Fisher, *Finland and the Tsars* (London, 1890); Nyholm, *Die Stellung Finlands im russischen Kaiserreich* (Leipzig, 1901); Arnheim (editor), *Der ausserordentliche finländische Landtag, 1899*, German translation from the Finnish (Leipzig, 1900); Getz, *Das staatsrechtliche Verhältnis zwischen Finland und Russland* (Leipzig, 1900). See RUSSIA; SWEDEN.

FINLAND, GULF OF. An arm of the Baltic Sea bounded by Finland on the north and east, the Government of Saint Petersburg on the east and south, and Esthonia on the south (Map: Russia, C 2). It extends in an easterly direction for over 250 miles, and varies in width from about 12 to over 80 miles, its narrowest point being at the eastern end. Its depth ranges from 26 to over 200 feet, although in a few places it exceeds 300 feet. The northern coast is rugged and bordered with numerous small islands. There are also islands, mostly uninhabited, in the midst of the gulf. By the Neva and the Ladoga Canal the gulf is connected with the lakes of Ladoga and Onega, while the Narova connects it with Lake Peipus. Besides the two above-mentioned rivers, the gulf receives a number of small streams, both from Finland and from Esthonia. Fish are abundant, the waters being especially noted for a kind of sardine, extensively caught near Reval. Navigation is considerable, although greatly hindered by sandbanks and rocks, and by ice during the winter. Among the ports are Reval, Kronstadt, Viborg, and Helsingfors.

FIN'LAY, GEORGE (1799-1875). An English historian, born near Faversham (Kent). He studied law in an office at Glasgow and Roman jurisprudence at Göttingen. In 1823 he proceeded to Greece, and accompanied Odysseus in an expedition to Argos (in the Morea), returned in disgust to the headquarters at Ligovitzi, and went thence to Scotland, where he concluded his legal studies and passed his civil law examination. In 1826 he was once more in Greece, and from that time until the termination of the war (1829) was either in active military service or employed in missions on behalf of the patriot cause. Later he purchased a landed estate in Attica, lost his fortune in farming enterprises, and turned his attention to study and the preparation of his volumes on Grecian history, entitled respectively *Greece Under the Romans* (1844), *Greece to Its Conquest by the Turks* (1851), *Greece Under Ottoman and Venetian Domination* (1856), and *Greek Revolution* (1861). These, with manuscript corrections and additions by the author, were published at Oxford under the editorship of H. F. Tozer as *A History of Greece, from Its Conquest by the Romans to the Present time,* B.C. *146 to* A.D. *1864* (1877). The work has remained standard, and of particular value on the Byzantine period. Consult the *Autobiography* in vol. i. of the Oxford edition mentioned above.

FIN'LEY, JOHN HUSTON (1863—). An American educator and editor. He was born at Grand Ridge, Ill.; studied at Knox College and the Johns Hopkins University, and became secretary of the New York State Charities Aid Association. He was president of Knox College from 1892 until 1899, when he accepted the position of editor of *Harper's Weekly*. Later in the same year he became editor of *McClure's Magazine*. Besides editing *The Charities Review*, which he founded, and contributing to periodical literature, he assisted Prof. Richard T. Ely in the preparation of *Taxation in American States and Cities* (1889). In 1900 he accepted the chair of politics in Princeton University.

FINLEY, JOHN PARK (1854—). An American meteorologist, born at Ann Arbor, Michigan. He graduated at the State Normal School at Ann Arbor, and continued his studies at the Michigan State Agricultural College. As assistant to the chief signal officer at Washington he instituted the system of meteorological reports from localities where there were no regular signal-service officers, by means of volunteer observers. He was later placed in charge of the Signal Service Bureau on the Pacific Coast, where his observations were of great value. His writings are extensive, his investigations regarding the phenomena of tornadoes being his most valuable contribution to meteorology. Among his published works are: *Tornadoes* (1887); *Manual of Instruction in Optical Telegraphy* (1889); *Sailor's Handbook of Storm-Track, Fog, and Ice Charts of the North Atlantic and Gulf of Mexico* (1889); and *Essay on the Development of Tornadoes* (1890).

FINLEY, MARTHA (MARTHA FARQUHARSON) (1828—). An American author. She was born in Chillicothe, Ohio, lived for many years in Philadelphia, and became widely known for her numerous stories of the Sunday School Library type. Her "Elsie Series" (26 vols.) has won especial popularity. Among her many other publications are: *An Old-Fashioned Boy* (1871), and *The Thorn in the Nest* (1886).

FINLEY, ROBERT (1772-1817). The organizer of the Colonization Society, born at Princeton, N. J. He graduated at the college in his native town at the age of 15 years, and taught school there, in Allentown, N. J., and in Charleston, S. C. In 1794, having returned North, he was licensed as a minister by the Presbytery of New Brunswick, N. J., and in 1795 accepted a call to Basking Ridge, N. J. During the following years he began to study the negro question, and came to the conclusion that the only solution of the problem was to colonize these people in some remote region, preferably on the coast of Africa. In December, 1816, he went to Washington, D. C., where he organized the Colonization Society, and among those who became interested in the project was John Randolph of Roanoke. At this time Dr. Finley was not aware that Jefferson had suggested a similar plan in a letter written in 1811, nor that only the previous autumn a motion had been made in the Virginia Assembly to colonize free blacks on the Pacific Coast. Toward the middle of January he returned to New Jersey, where he organized an auxiliary society, and then went South again and became president of the University of Georgia, where he died. See COLONIZATION SOCIETY.

FINLEY, SAMUEL (1715-66). An American clergyman of the Presbyterian Church, born in County Armagh, Ireland. He came to Philadelphia in 1734, was licensed to preach in 1740, was ordained by the New Brunswick Presbytery in 1742, and in 1743 was settled at Milford (in the present New Haven County), Conn. Having preached at New Haven to the 'Second Society' of that place, an organization unrecognized by the Church, he was seized as having violated the law forbidding itinerants to preach in any parish without the consent of the settled pastor, and was ejected from the colony as a vagrant. From 1744 to 1761 he was pastor at Nottingham, Md., where he also conducted an academy which enjoyed a considerable reputation. In 1761 he became president of Princeton. He was the first Presbyterian clergyman in America to receive the degree of D.D. from the University of Glasgow (1763). His publications consisted entirely of sermons, among them *Christ Triumphing and Satan Raging* (1741), *A Charitable Plea for the Speechless* (1747), and *On the Death of President Davies* (1761).

FIN′NEY, Charles Grandison (1792-1875). An American clergyman and educator, born at Warren (Litchfield County), Conn. After a common-school education he began the study of law in 1818, in 1821 abandoned the law for theology, was licensed to preach by the Presbyterian Church in 1824, and was active as an itinerant evangelist from that time until 1835 and at subsequent intervals. In 1834 he became pastor of the Congregational Church known as the Broadway Tabernacle. He was called to the chair of theology in Oberlin College (Oberlin, Ohio, then known as the Oberlin Collegiate Institute) in 1835, was appointed pastor of the Congregational Church at Oberlin in 1837, and from 1851 to 1866 was president of the college. In 1849 and 1858 he visited England as a revivalist. He established the *Oberlin Evangelist* in 1839, and was its editor until 1863. Among his publications are *Lectures on Revivals* (1835; enlarged ed. 1868), *Sermons on Important Subjects* (1839), and *Lectures on Systematic Theology* (1847, new ed. 1878). Consult his *Memoirs* (New York, 1876).

FINNISH LANGUAGE AND LITERATURE. The language used by the people known as Finns, inhabiting Finland, or dispersed throughout Lapland, the Baltic provinces, other parts of Russia on both banks of the middle Volga (through Perm and Vologda), West Siberia, and Hungary, and constituting the western or Finno-Ugric branch of the Great Uralo-Altaic family. (See Finns.) The richest and most highly cultivated languages of the family are the Suomi, the language of Finland, and the Magyar (Hungarian). The dialects are all distinctly agglutinative forms of speech, with decided tendencies toward inflection, so much so that in many grammatical endings the essential difference between agglutination and inflection becomes obscured. As in other Uralo-Altaic tongues, progressive vowel-harmony forms a characteristic feature of the Finnish group. It is maintained by some that the Finnish languages represent the oldest forms among the Uralo-Altaic groups. There is strong evidence that the Finns, or a closely allied race, must have at one time, probably prehistoric, been spread over a considerable area of central, if not of western Europe. The Finnish language is spoken by over 2,000,000 people, and in several different dialects, of which the most important are the East Finnish or Karelian, the South Finnish, and the West Finnish. The first of these is the oldest and least developed; the second is the main vehicle of Finnish literature. It is emphatically vocalic. It has five fundamental vowels—*a*, *e*, *i*, *o*, and *u*—and employs two diphthongs. The grammatical relations between the several parts of speech are expressed exclusively by suffixes. Nouns are used without any article, have no gender, and are declined, in both singular and plural, through fifteen different cases, so as to express the relations which in the Indo-Germanic languages are commonly indicated by prepositions. Verbs have but two tenses, present and past, the future tense being expressed by a circumlocution; but their conjugation is very intricate. The language is capable of expressing the nicest shades of meaning. Consult Eliot, *Finnish Grammar* (Oxford, 1889).

The chief monument of Finnish literature is the *Kalevala*, a sort of epic poem, which until the last century existed only in the memory and on the lips of the peasantry. A collection of some of the scattered parts of this poem was published in 1822 by Zacharias Topelius; but Elias Lönnrot, thirteen years later, published a far more complete collection, at the same time giving to it the name by which it is now known. Lönnrot wandered from place to place among the peasantry, living with them and taking down from their lips all that they knew of their popular songs. After unwearied researches he was successful in collecting 12,078 lines, which he arranged into 32 runes or cantos, and published them exactly as he heard them sung or chanted. Continuing his researches, he published in 1849 a new edition of 22,793 verses, in 50 runes. The importance of this long-hidden epic was at once recognized in Europe, and translations of it were made in several languages. Some specimens of it were translated into English by Professor Porter, of Yale, and published in New York in 1868. The entire poem was translated by J. M. Crawford (1888). It has been several times translated into Swedish, the first time by Castrén, and there are versions in German by Anton Schiefner (1852), in French by L. de Duc (1868), in Hungarian by Ferdinand Barna (1871). The poem is written in eight-syllabled trochaic verse, and an idea of its style may be obtained from Longfellow's *Hiawatha*, which approaches a true imitation of the Finnish epic. The *Kalevala* is concerned entirely with the mythology or folk-lore of the people. In the story there is a certain unity of plot, though the various parts are not perfectly homogeneous, and appear to be the product of different minds at different periods, the various songs having evidently received additions in course of time. They probably originated before the Finns were converted to Christianity, and when they were not scattered as they are now. When Lönnrot collected the *Kalevala* songs he also gathered a considerable quantity of lyric poetry, which he published under the name of *Kanteletar*, from the name of the national instrument to which they are sung—a species of harp with five strings. Of recent Finnish poets the most popular seems to be Paavo Korrhoinen, a peasant, a very sarcastic writer. Other modern poets are Marteska, Kettunen, Ilhainen, Oksaselta. Finnish poets that have used the Swedish language will be treated under Swedish Literature. The Finns delight in proverbs, Lönnrot having published a collection of upward of 7000, with about 200 charades, while considerable collections of legends and tales have been published. The first printed book in Finnish was probably the *Abecedarium* of Michael Agricola, Bishop of Åbo, which appeared in the middle of the sixteenth century. A translation of the New Testament by the same bishop appeared in 1548, at Stockholm. The whole Bible was not translated into Finnish till 1642. During the last two centuries there has been considerable literary activity in Finland, and books in almost every branch of research are found in the language, mainly translations or adaptations. Finland is rich in periodicals of all kinds, the publications of the Finnish societies of literature and of the sciences and other learned bodies being specially valuable. Works on Finnish history and geography are quite numerous. The publication of the *Kalevala* gave a powerful impetus to the study of the Finnish language, which the Russian Government till recently sustained by encouraging the cultivation and use of their native tongue by the Finlanders. The upper classes still cling to the use of Swedish, but the peasantry and small landed proprietors welcome with avidity every addition to the limited stock of their printed literature, and Finnish weekly papers circulate freely among them. The prose literature of Finland is almost exclusively devoted to religious and moral subjects.

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FINNISH VERSION. See Bible.

FINNS. A people of northern and eastern Europe and western Siberia. Ethnologically they have been classed with Lapps, but Ripley calls attention to the fact that among the Esths on the Baltic coast, through the Tcheremisses on the Volga, and beyond the Ural Mountains among the Ostiaks and Voguls in Siberia exists a longheadedness not a whit less pronounced than throughout Teutonic Germany. The Finns described by Retzius and others are said to be the tallest of men, with fair skin, flaxen hair, and blue eyes. Height (Tavastians), 1.682 meters; soldiers, 1.713 meters. The cranial index among the Livs, Esths, Tcheremisses, Tchuvashes, and Vogul-Ostiaks is as low as 79 or 80. There are, however, peoples speaking Finnish dialects who are short and brachycephalic. Indeed, they are mixed in blood and necessarily present inharmonious characteristics.

Finnish-speaking people having in their veins more or less Finnish blood may be divided as follows:

TCHUDIC BRANCH.

(1) Finnic or Suomic. The Finnish language proper, or Suomi, is spoken in Finland and the border regions of Russia proper.

(2) Esths. Esthonia, Livonia, etc., in Russia.

(3) Tchuds. Olonetz and Novgorod, Russia.

(4) Lapps. Lapland, in Norway and Russia.

(5) Vots. Saint Petersburg Government in Russia; uncertain.

(6) Livs and Krevings. In Livonia and Courland, Russia; not certain.

PERMIAN BRANCH.

(1) Votiaks. Between the Kama and Viatka rivers in Russia.

(2) Sirians. Mostly on the Vitchegda River, East Russia.

(3) Permiaks. Perm, Russia. Bissennian dialect, with Votiaks.

VOLGAIC BRANCH.

(1) Tchuvashes. Kazan, Saratov, Simbirsk, and Orenburg, Russia.

(2) Mordvins. Chiefly between the Oka and Volga rivers, East Russia.

(3) Tcheremisses. Viatka, Kazan, Kostroma, and Nizhni-Novgorod, Russia.

UGRIC BRANCH.

(1) Magyar or Hungarian. Hungary; with the Székler dialect in Transylvania.

(2) Samoyeds. Twenty thousand in all. A few in North Russia, but chiefly in Siberia.

Consult Ripley, *The Races of Europe* (New York, 1899), with excellent bibliography from Castrén (1857) to Niederle (1896). See Finnish Language and Literature.

FINS′BURY. A northern district and Parliamentary borough of Greater London, England. It consists of Holborn, Central and East divisions, with a total population in 1901 of 165,865. The district was known as Holywell in olden times. In Jonson's day, as Finsbury Field, it was a resort for the commoner classes of the capital, and as such is mentioned by Shakespeare in *Henry IV.* (First Part).

FINSCH, fĭnsh, Otto (1839—). A German ornithologist and traveler, born at Warmbrunn, Silesia. In 1858-60 he traveled through Hungary, Turkey, and the Balkan region, and in 1864 was appointed director of the Museum of Natural History and Ethnology at Bremen. In 1876 he was placed in charge of the scientific exploring expedition organized by the Polar Society of Bremen. He visited Turkestan, northwestern China, and the Altai region, and journeyed through the region of the Obi to Kara Bay. In 1879 he traveled through the Hawaiian Islands, a part of Micronesia, Melanesia, Australia, and New Zealand. This journey was made under the auspices of the Royal Academy of Science at Berlin. Having returned in 1882, he was two years later sent out by the New Guinea Company to explore the northeastern coast of New Guinea, now a protectorate of Germany under the name of Kaiser Wilhelms Land. His publications include: *Neuguinea und seine Bewohner* (1865); *Samoafahrten Reisen in Kaiser-Wilhelms-Land und Englisch-Neuguinea,* with ethnological atlas and 24 plates (1888); *Ethnologische Erfahrungen und Belegstücke aus der Südsee* (1888-93), a work on the Bismarck Archipelago, New Guinea, and Micronesia.

FIN′STERAAR′HORN. The highest peak of the Bernese Alps, having an altitude of 14,026 feet (Map: Switzerland, C 2). See Alps.

FINSTERWALDE, fĭn′stẽr-väl′de. A small town of Prussia, in the Province of Brandenburg, situated on an affluent of the Black Elster, 40 miles north of Dresden (Map: Prussia, E 3). There are manufactures of cloth and machinery; also iron-foundries, flour and saw mills, and spinning and weaving establishments. The town has a fine old Gothic church, dating from the sixteenth century, and an old castle. Population, in 1890, 8133; in 1900, 10,726.

FIONN, FINN, or **FIND**. See Fenian Society: Fingal.

FIONN MACCUMHAIL (i.e. 'Fionn, son of Cumhail,' pronounced *Fin MacCool*). An Irish epic hero, general of the Féinne or armed bands of Ireland in the third century of the Christian Era. Although, as always in ancient sagas, we find much of myth interwoven with the story of his life and exploits, there seems no reason to doubt the basic truth of the tradition. Among his chosen companions were Goll, Diarmid, his own son Oisín (Ossian), and a wonderful dog, Bran. Unlike Cuchulain, his name is as familiarly known among the Scotch Gael as in Ireland, although in Scotland it sometimes takes the form of Fionn-gall, i.e. Fionn the Stranger, indicative of an outside origin. A later bardic tradition brings down the Fenian saga to the introduction of Christianity into Ireland, and the baptism of Oisín after a sojourn of two hundred years on an enchanted island of perpetual youth. From metrical fragments of the Gaelic tradition, collected in the Highlands, Macpherson elaborated his celebrated *Poems of Ossian.*

FIORAVANTI, fyō′rȧ-vän′tė, Valentino (1764-1837). An Italian composer. He was born in Rome, and was instructed by Jannaconi in Rome, and by Fenaroli, Monopoli, Sala, and Tritta in Naples. He lived, as a conductor and composer successively in Rome, Naples, Paris, and Lisbon, and eventually returned to Rome. In 1816 he succeeded Jannaconi as *maestro* at Saint Peter's, and henceforth devoted himself exclusively to Church music. Among his best compositions, however, are his comic operas, of which he produced about fifty, *Le cantatrici villane* (1806) being considered his finest production.

FIORD, or **FJORD**, fyôrd (Norweg., Dan., bay, inlet). An inlet of the sea, or a narrow bay, indenting a mountainous coast and penetrating deeply into the interior. Fiords are bordered by steep, rocky walls, which descend without interruption to considerable depths below water-level. Their origin is usually explained by subsidence of the coast, whereby the sea floods the valleys and washes directly against the mountain flanks. Glacial erosion may have been a factor in determining the prominent relief of the land previous to submergence. The most notable fiords are on the coast of Norway, the longest being the Sogne Fiord, which extends inland for a distance of 100 miles, and is shut in throughout its entire length by high and precipitous rock walls. Hardly less prominent are the fiords of Christiania and Trondhjem. The coasts of British Columbia and southern Alaska, of Iceland, Greenland, Patagonia, and of parts of New Zealand are marked by similar inlets. They are also found on the coasts of Maine and Nova Scotia. Many of the lochs and firths indenting the shores of the British Isles possess the characteristics of fiords. See Shore.

FIORE, fyō′rȧ, Pasquale (1837—). An Italian jurist, born at Terlizzi, Bari. He was appointed professor of constitutional and international law at the universities of Urbino (1863), Pisa (1865), Turin (1876), and Naples (1881), and wrote the following works, some of which have been translated into French and Spanish: *Elementi di diritto constituzionale* (1862); *Diritto internazionale privato* (1869); *Trattato di diritto internazionale publico* (1879); and *Trattato di diritto internazionale penale.*

FIORELLI, fyô-rĕl′lė, Giuseppe (1823-96). An Italian archæologist, born in Naples. In 1845 he was made inspector of the ruins of Pompeii, but was displaced because of his political opinions. Upon the establishment of the Kingdom of Italy, he became superintendent of antiquities in the southern provinces, and also professor of archæology in the University of Naples (1860). In 1875 he was made director of all the excavations in the country. His publications include: *Osservàzioni sopra talune monete rare di città greche* (1843); *Monete inedite dell' Italia antica* (1845); *Notizia dei vasi dipinti rinvenuti a Cuma dal conte di Siracusa* (1853); *Pompeianarum Antiquitatum Historia* (1853); and *Descrizione di Pompei* (1875).

FIORENTINO, fyō′rĕn-tē′nô, Francesco (1834-84). An Italian philosopher. He was born at Sambiase, Calabria, and was educated at the University of Naples. After teaching philosophy at Spoleto, he was appointed professor of that science successively at the universities of Bologna, Naples, Pisa, and again at Naples. He was long a member of the Italian Parliament, was the editor of an edition of Giordano Bruno's *Opera Latina* (vols. i. and ii., 1879-84), and published a large number of independent works, of which *Elementi di filosofia* and *Manuale di storia della filosofia* (Naples, 1879-81) deserve especial mention. He was Hegelian in his philosophical sympathies.

FIORI D'URBINO, fyō′rė dōōr-bē′nô, Il. See Barocci, Fedrigo.

FI′ORIN. See Red-Top; Bent Grass.

FIORINI, fyô-rē′nė, Matteo (1827-1901). An Italian geographer, particularly distinguished as a historian of cartography. He was born at Felizzano (Alessandria), and he became an hydraulic engineer in 1848. He lectured at the University of Turin from 1848 until 1860, when he was appointed professor of geodesy at the University of Bologna, with which institution he remained associated during the last thirty years of his life. In addition to numerous essays, he published the following works: *Le projezioni delle carte geografiche* (1881), still regarded as a standard work; *Le sfere cosmografiche e specialmente le sfere terrestri* (1894; German translation by S. Günther, 1895); and *Sfere terrestri e celesti di autore italiano* (1899).

FIR (AS. *furh*, Icel. *fura*, OHG. *forha*, Ger. *Fohre;* ultimately connected with Lat. *quercus*, oak). The popular name applied to many coniferous trees of the genus Abies. This name has often been employed to embrace all the evergreen coniferous trees that have short, rigid leaves, occurring singly, scattered over the stems, as distinguished from the pines (Pinus), whose leaves are longer and usually occur in bundles of two to five or more, and from those conifers having small imbricate scale-like leaves, as arbor-vitæ and various cedars. The name fir should be retained exclusively for species of the genus Abies, and the related trees should be called hemlock (Tsuga), spruce (Picea), etc. Much confusion has existed in the botanical nomenclature of all these trees, but, following the best modern conception of them, the use of fir should be limited as above. The species of Abies are mostly trees of pyramidal habit, with erect cones, maturing in one season. Their short leaves, arranged upon the horizontal branches in such a way as to appear to be two-ranked, are flattened, the midrib showing prominently upon the under side. There are about 25 species found throughout the cooler portions of the north temperate zone. One of the most common is the silver fir of Europe (*Abies picea* or *Abies pectinata*). It is a common tree in central Europe, attaining a height of 150 to 200 feet, with a basal diameter of six to eight feet. In some places it occurs over extensive tracts to the almost entire exclusion of other species. The wood, which is white, soft, of light weight, and contains little resin, is employed in many ways. The tree yields the Strassburg turpentine, which is a superior clear variety. Quite similar is the North American balsam-tree (*Abies balsamea*). This species is found from Virginia northward. It attains a height of 50 to 80 feet; the wood is light and not durable. From the sap Canada balsam is obtained. Closely related to it is Fraser's fir (*Abies Fraseri*), which is found farther south. This is a smaller tree, with smaller cones and different shaped bracts. Upon the Pacific Coast are a number of indigenous species of fir, the timber of which is very valuable. *Abies grandis*, which is found from British Columbia to Lower California, one of the finest trees of that region, is known as the great silver fir, and attains a height of 300 feet and a diameter of 10 feet or more. The wood is white and soft, and is extensively consumed for cooperage, boxes, etc. Closely related to it is the *Abies nobilis* of the same range, with much the same characteristics. Both species are highly valued in England as ornamentals, but they have not been extensively planted in the eastern United States. *Abies Nordmanniana* of the Caucasus is one of the most hardy of all the species of fir. It is a tree that becomes 150 feet high, with a trunk diameter of four or five feet. It has been introduced for forest and windbreak planting in parts of the United States, and has already proved one of the most valuable evergreens for such uses. The Mount Enos fir (*Abies cephalonica*) and the Spanish fir (*Abies Pinsapo*) occur in the south of Europe, where they are trees 50 to 80 feet tall. Their timber is considered valuable. *Abies Webbiana* occurs in the Himalaya Mountains at elevations from 7000 to 13,000 feet. It is a fine tree, growing to a height of 130 feet or more, and diameter of eight to ten feet. The wood is harder and heavier than that of most species of fir, contains more resin, and as timber is very valuable. In Mexico is found *Abies religiosa*, a magnificent silvery-leaved tree, which grows to a height of 150 feet, and a diameter of six feet. It is well adapted to lath and shingle making. The boughs are extensively used as a church decoration. A number of other species attain the size of large trees, as *Abies bracteata* of the Pacific Coast; *Abies Sibirica* of Siberia and Russia; *Abies cilicica* of Asia Minor; *Abies Veitchii*, and *Abies homolepis* of Japan. Of many of the above enumerated species of Abies there are cultural varieties that differ in habit of branching, color of foliage, drooping habit, etc., some of them being very handsome ornamental trees. For accounts of the somewhat similar and often combined species of evergreen conifers, see SPRUCE and HEMLOCK.

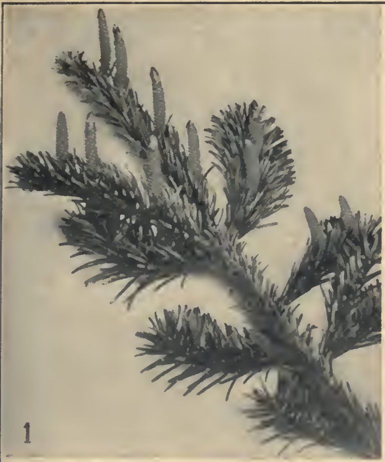
FIRANGI, fê-rän′gê. An Eastern name for Europeans, whose land is called Firangistan. The name is supposed by some to be a corruption of Frank, and to date from the Crusades, while by others it is derived from the Varangians (Warings), Norsemen who entered into the service of the Byzantine emperors at Constantinople. In Bengal the mixed descendants of the Portuguese, though differing in no respect but religion from the natives, are especially distinguished by the term *Firanghis.*

FIR′BOLGS. The name given in the fabulous early history of Ireland to a tribe said to have descended from the Nemedians, who, under their leader Nemedius, came to the island some twenty-three centuries before the Christian Era. After remaining for about two centuries, the greater part fled because of the oppression of African pirates known as the Formarians. The Nemedians formed three bands, one going to Scotland, another to a northern part of Europe, becoming the Tuatha de Danann of a later period, and the third to Greece. The colony in Greece, or the Firbolgs, became restive under oppression and decided to return to Ireland, and under the rule of the five sons of Dela they enjoyed full possession of Ireland for something less than a century. Their kinsmen, the Tuatha de Danann, also returned, and the Firbolgs were forced to consent to the partiton of the land. Such was the condition of Ireland until the Milesians came. These had left Egypt for Spain, and after subjugating the latter country, had determined to conquer Ireland. They became masters of the island about B.C. 1700. See IRELAND.

FIRCKS, fērks, THEODOR VON, Baron (1812-72). A Russian author, born at Kalven, Courland, and known under the pseudonym Schédo-Ferroti. He became an officer in the engineer corps of the Russian Army, and subsequently Russian diplomatic agent at Brussels. He was dismissed in consequence of his publication of a brochure in favor of the Polish cause entitled, *Lettre d'un patriote polonais au gouvernement national de la Pologne* (1863). His most important work, *Etudes sur l'avenir de la Russie* (1858-68), his *Lettres sur l'instruction populaire en Russie* (1869), and *Die internationale Arbeiterbewegung* (1872), made him in his time a very influential writer in the domain of Russian politics.

FIRDAUSI, fēr′dou-sē′, or **FIRDUSI**, fēr′-do͞o-sē′, ABU'L KASIM MANSUR, or AHMAD, or HASAN (c.935-1020). The greatest epic poet of Persia, and one of the foremost in all literature. He was born in Tus in Khorassan about 323 A.H. (A.D. 935). The name of his father is quite unknown, but he seems to have been a man who lived in very comfortable circumstances and one of the Dihqān or landed gentry. The best account of the poet's life is given by 'Arudī of Samarkand, who visited Tus about a century after the death of Firdausi. This record is preserved by Ibn Isfandiyār in his chronicles of Tabaristan (the passage is published by Ethé in vol. xl. of the *Journal of the German Oriental Society*). At the age of twenty-eight Firdausi married, and of the two children born to him, one, a daughter, survived

FIRS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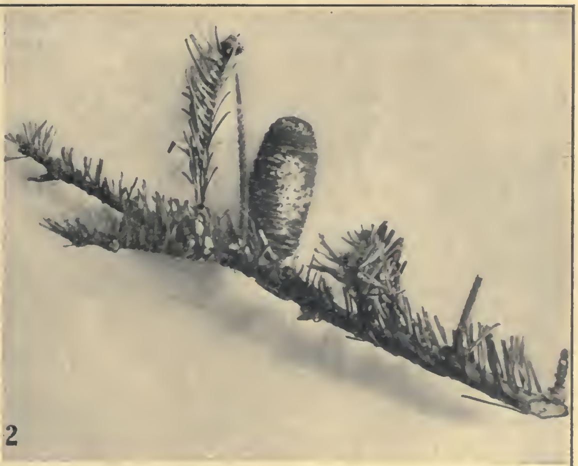
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1. WHITE FIR FEMALE FLOWERS.
2. WHITE FIR CONE.
3. WHITE FIR TREE (Abies grandis).
4. BALSAM FIR (Abies balsamea).

her father. When the poet was about thirty-six, he began the work which has made his name immortal, the *Shāh-Nāmah*, or Book of Kings, which occupied him for thirty-five years. Other Persian poets had tried their hand at the theme before him, for the remembrance of their own Iranian history was preserved despite the conquest by Islam. Of these predecessors the most noteworthy was Daqīqī, who flourished in the tenth century A.D. His work, placed in Firdausi's hand by his compatriot, Mohammed Lashkari, formed the nucleus of the *Shāh-Nāmah.*

This great Book of Kings traces the history of Persia from the mythical ruler Gayumart, who lived, according to Iranian tradition, about B.C. 3600, to the Mohammedan conquest in A.D. 641.

The poem, which according to Firdausi's own account contains 60,000 couplets, or more than seven times the amount of the *Iliad*, treats first of the legendary kings of Iran, Gayumart, Hoshang, Tahmuras, and Jamshid, who was the most famous of them all, and reigned five hundred years during the golden age of the earth. Following this happy period came the evil rule of the Arab Dahak or Zohak, who was tempted by Ahriman, his own ancestor, and fell into sin, increasing his evil until the smith Kavah set up his leathern apron, as the banner of revolt, and Fredun, the Thrætaona of the Avesta, came and bound the tyrant and confined him beneath Mount Demavend on the shores of the Caspian. The reign of Fredun was a long one, but its close was darkened by the strife of his three sons, among whom he had divided the kingdom. He was succeeded by Minochihr. At this point in the poem there is inserted an episode of exceptional beauty which recounts the loves of Zal, of the royal line of Iran, and Rudabah, the daughter of the King of Kabul, whose union was blessed by the birth of the most romantic of all the heroes of the *Shāh-Nāmah*, Rustam, who occupies a position in Iranian legend somewhat analogous to that of Hercules in the classic literatures. It was Rustam who, during the reign of Kaus, won Mazandaran for the Persian King, and performed seven romantic and perilous quests before he could succeed. It was he too who in combat unwittingly slew his own son Suhrab, who, ignorant of his paternity, was fighting among the foes of Iran. Later Rustam again invaded Turan to revenge the murder of Syavush, a son of Kaus. He fought also with Firud, King of India, and with the powerful Turanian ruler Kamus. From this time on until the dawn of the historical period, the *Shāh-Nāmah* is occupied mainly with accounts of the wars between the Iranians and their hereditary foes, the Turanians. With the opening of the reign of Gushtasp there is an episode of extreme importance giving an account of Zardusht or Zoroaster (q.v.). The interest of the epic, which was slightly less during the reigns of Khusrav and Lohrasp, now revives, and it is continued by the legend of the seven adventures of Isfandiyar, the son of Gushtasp. The father's jealousy of his son, however, caused Isfandiyar to be imprisoned, until his aid against the Turanian Arjasp became indispensable. Then he was released, but as soon as possible was sent by Gushtasp on further adventures, and at last was craftily matched in a duel with Rustam, by whom the younger hero was slain, while Rustam himself soon afterwards fell in battle. It is noteworthy that there is no mention in the *Shāh-Nāmah* of the Achæmenes (q.v.), a fact which is not as yet altogether satisfactorily explained. Of the Arsacidæ Firdausi knows only the names. The history takes a sudden leap to the Sassanian kings (q.v.). According to the *Shāh-Nāmah* Gushtasp was followed by Bahman and his son Dara (Darius), who married a daughter of the Emperor of Rum (Byzantium). This princess, who was soon divorced by Dara, gave birth at Byzantium to Iskandar, or Alexander the Great (q.v.). The remainder of the epic, excepting for the long account of the reign of Bahram Gur, is of less interest. It traces with a fairly close adherence to history the reigns of the Sassanian kings down to the defeat and death of Yezdegird III. Yet there are interwoven in this latter part of the epic, and elsewhere, numerous episodes of much interest. Among these may be noted the story of the seven banquets of Nushirvan with the sages, of whom he inquires concerning a mysterious dream, the introduction of chess from India into Persia during the reign of the same monarch, and the story of the loves of King Khosru Parviz and Queen Shirin.

Thus we have a valuable source for the early history of Iran, which is needed to supplement the accounts given in the Old Persian cuneiform inscriptions and the Avesta (q.v.). It would seem that Firdausi had a distinctly patriotic motive in writing the *Shāh-Nāmah* in addition to his poetic and historical incentives. He plainly desired to keep alive in the hearts of the Persians the glories of their ancestors' deeds and faith in order that they might not become mere puppets under Arab domination. This is shown not alone by the theme and spirit of the epic, but even by the diction employed. While it is considered a mark of elegance in other Persian poetry to employ as large an element of Arabic as possible, Firdausi rigorously adheres throughout to the native Persian vocabulary, and the percentage of Arabic words in his work is extremely low. The poem flows on in a dignified style, without the excess of coloring or the straining after effect which is sometimes found in Oriental poetry.

The epic as a whole is dedicated to Mahmūd of Ghazni (see GHAZNIVIDES), to whose court Firdausi went to present his work as the tribute of a poet of fame. Meagre was his reward from the parvenu Turk; at most the sum was not more than 20,000 dihrams (about $2400). The disappointed poet found revenge in a bitter satire on Mahmud, which he substituted for his former eulogies of the Sultan. Firdausi then fled to Herat, and thence to Tabaristan, where the prince, Ispahbadh Shahryar, protected him, and counseled him to withdraw the offensive verses against Mahmud. This advice was followed, and it would seem, from the poet's later history, that the lampoon never reached the Sultan. Firdausi, now upward of seventy-five years of age, is next found in Iraq. Here he composed a romantic epopee of 9000 couplets on the loves of Yusuf and Zalikhā, the Arabic version of the biblical story of Joseph and Potiphar's wife, a favorite theme of Oriental poets. In his old age Firdausi returned to his childhood's home. There is a tradition that Mahmud at last forgave the poet for his satire, and sent him a present of 60,000 dihrams (about $7200). A portion of this may well be true. At all events, we know that he died in peace, probably in 411 A.H. (A.D. 1020). About the name of Firdausi, as of many other great authors, a number of poetic legends have gathered. As an example may be mentioned the story that Mahmud's gift of favor came at the moment when the body of the poet was being carried to its final resting-place.

BIBLIOGRAPHY. Editions of the *Shāh-Nāmah* have been published by Macan (4 vols., Calcutta, 1822-29); Mohl (6 vols., Paris, 1831-68); Vullers and Landauer (3 vols., incomplete, Leyden, 1877-84); translations by Mohl (7 vols., Paris, 1876-78); Rückert (incomplete, Berlin, 1890); Pizzi (8 vols., Turin, 1886-88); Schack selections (3 vols., Stuttgart, 1877). There is an abridgment in English by Atkinson (London, 1832, reprinted New York and London, 1886), and a popular sketch of the *Shāh-Nāmah* in Reed's *Persian Literature* (Chicago, 1893). A critical edition of the *Yusuf u Zalikhā* was published by Ethé (Oxford, 1902), and the poem has been translated by Schlechta-Wssehrd (Vienna, 1889). For further information consult: Nöldeke, *Grundriss der iranischen Philologie*, ii. (Strassburg, 1896); Ethé, id. (Strassburg, 1891); Horn, *Geschichte der persischen Litteratur* (Leipzig, 1901); Browne, *A Literary History of Persia* (London, 1902), and the authorities referred to there.

FIRE. The discharge of firearms, as the *fire* of the enemy, *broadside fire*, etc. *Bow fire* includes the fire of all pieces of a ship which are so mounted as to be able to fire directly ahead; *stern fire,* that of all pieces which can fire directly astern; *broadside fire,* all which can fire abeam. A *raking fire* is one so delivered that the projectiles pass through a vessel in a fore-and-aft direction, or nearly so. A *plunging fire* is one directed downward from an elevation; if directed at a vessel such a fire would pierce her decks. *Direct fire* is used when the gun is aimed so that the projectile will hit by direct impact. *Ricochet fire,* much used in the days of spherical projectiles, consisted in firing at a short range and allowing the shell to ricochet, or be reflected from the surface of the water, once or twice before reaching the object aimed at. Elongated projectiles from rifled guns ricochet in a very irregular manner, usually turning sharply to the right and oftentimes rising at a considerable angle after meeting the water; this behavior of rifle shell has caused the discontinuance of *ricochet fire. Height angle, mortar,* or *howitzer fire* is effected by elevating the piece at angles of 30 degrees or more above the horizontal and effecting a hit by dropping upon the object. The same effect is obtained by *curved fire* from ordinary guns, which is brought about by extra elevation and a reduction of the powder-charge. Both kinds of fire are used to reach objects over other higher ones which intervene. See GUNNERY; MORTAR; ARTILLERY; BALLISTICS.

FIRE, PRIMITIVE. The conception of early man as a fireless animal has been entertained from remote times, and the prevalence of this idea in origin-myths seems to present a real survival in lore from the primitive period. This great body of lore with attendant customs clearly points out the stages in man's progress by which fire from an unused and almost unknown force became interwoven with his life as a prime necessity. These stages represent: (1) man in the same case with his feral neighbors as to fire, but having a clearer knowledge of its manifestations in the lightning, volcanoes, and other exhibitions in nature (stages of the knowledge of fire); (2) from some of these sources fire is acquired and preserved for the most primitive use conceivable, perhaps for protection from the beasts (stage of acquisition and preservation of fire); and (3) the stage marked by the invention of a process of creating fire at will, either by friction of wood in the fire-drill, fire-plow, and fire-saw, or by the percussion of minerals in the flint and pyrites (stage of fire-producing). Growing out of these great strides in man's progress, comes the fourth stage, marked by an increasing utilization of this element down to the present (stage of the conquest of fire).

It will be seen that in respect to the distribution of mankind over the earth, fire has played the leading part. In the first stage, before the use of fire, the distribution of man fell under the laws regulating the movements of animals. In the second stage, with the preservation of fire, man became sedentary and aggregated into groups having the germs of the State. In the third stage, with the means of providing fire at will, fire preservation sank into a lower place, and man became free to immigrate into different zones. With the cumulative employment of fire in the mechanical era, there enters a time element, and great masses of humanity move quickly to settle the waste places of the earth where before the movement was slow. From this most fertile of beginnings in the camp-fire have grown a great majority of the arts that have supplied man's artificial wants—those primary arts represented by lighting, cooking, offense and defense; and those secondary arts connected with the mechanics of fire or its use in agriculture, timbering, boat-building, metallurgy, ceramics, etc., all with vast ramifications. There is also a social history of fire, a mythology embracing the various phases of fire-worship with its ceremonies and observances, and a folk-lore of magnitude and surpassing interest.

FIRE, ORDEAL BY. See ORDEAL.

FIRE, SAINT ANTHONY'S. See ERYSIPELAS.

FIRE-ALARM. A fire-alarm system consists of a telegraph with a network of wires running from a main office to all parts of a district, and provided with signal-boxes conveniently placed and accessible, from which signals may be sent to the fire department by any one without special knowledge of the instruments, simply by turning a crank or pulling a hook. Each signal-box contains a transmitter or device to make and break an electric circuit, in a manner more or less closely resembling the following description, which will serve to illustrate the principle involved: A metallic wheel is provided with teeth, the spaces between which are filled with some non-conducting substance; a contact spring rests against the wheel, and as the wheel is turned, touches in succession the projecting teeth, closing the circuit at each tooth, and causing a signal at the central office, or, in small towns where there is no central office, at all the engine-houses with which the wire is connected. If the arrangement on the wheel should be two teeth, a space, three teeth, a space, and two teeth, followed by a long space, one rotation of the wheel would give two signals, then three, then two, or the number 232, and this number will be repeated as often as the wheel is rotated. The wheel may be turned by a crank or by a spring. The signal is received upon the common Morse recording instrument, and registered on a strip of paper; or both its receipt at and transmission from the central station may be recorded by pens on a revolving paper roll. There is often provided an inner box, to which the firemen only have keys, which contains telegraph instruments for use in communicating with headquarters, by means of which the officer in charge is enabled to give information and call for such extra and special supplies as are needed. The outer or fire-alarm boxes are generally only to be opened with keys intrusted to citizens, the nearest resident, the police, etc., but automatic doors for alarm-boxes are also used. These may be opened without a key by simply twisting the door-handle.

In cities having a central office in connection with the fire-alarm system, the alarm signals are all received here and then repeated to the local engine or hose house, either by hand or by automatic machinery under the control of the central operator. The signals are in some systems sent to all the companies, and the fire attended by those that are nearest and assigned to that district. In other systems the signals are only sent by the central operator to such companies as should go to the fire. For less important cities an automatic repeater may be used, thus doing away with the necessity of a central office attendant. In small towns and villages with only a few alarm-boxes and one wire circuit, the alarm may be operated directly from the call-box. In large cities, however, many circuits are necessary, which, in connection with the apparatus at the central office, may be so arranged that two independent signals are sent out to the proper stations for every fire by the use of separate instruments and circuits for each. The first signal in the fire station is sounded on a gong and the box number is printed on a tape. It is sent by a single movement of a lever. The second signal is in accordance with a code, the number of sounds indicating the exact response to be made to the call. A gong sounds the box number, which is also shown on an indicator with large figures. The central stations are equipped with various other devices, such as annunciators to show what companies are sent to a fire, and, therefore, which are still available; automatic circuit-testing machines, reporting breaks in the circuit, if any, at set intervals; switchboards, storage batteries, controlling and testing boards. instruments for measuring the current used to charge the battery, and also that in the wire circuits. The simpler forms of call-boxes are constructed in various ways, and to secure greater reliability, there are provided lightning arresters; cut-outs to prevent interference from high potential lighting or power currents; trap keys which cannot be recovered in case of alarms sent by private citizens until a fireman releases them by another key; and the keyless boxes and telegraph instruments already mentioned. The wire system may be strung on poles or placed underground. It must be carefully protected from harm in either case, particularly from accidental connection with any other electric wires. When put underground, wires may be placed in tile, wood, or iron conduits. See SUBWAYS FOR PIPES AND WIRES.

Auxiliary fire-alarms are extensions of the ordinary service to buildings, or each room in a building, if desired. Small call-boxes are connected by proper wires with the nearest street alarm-box, which may be set in operation by breaking a glass in the small box and pulling a chain. A return signal shows whether or not the street box has acted.

Automatic fire-detectors are instruments which will close an electric circuit when the surrounding temperature reaches a certain point, thereby setting in operation the ordinary fire-alarm telegraph apparatus with which it is connected, or giving a local alarm by ringing a gong, or both. Some form of thermostat is generally used to close the circuit, of which as many may be used as are desired; or what may be termed a thermostatic cable may be employed, traversing walls and ceilings as freely as may be deemed advisable, or temporarily trailed over floors or over piles of goods. In such cables one of the wires forming the circuit is coated with expansive metal, wrapped with a yielding insulator, then further surrounded with a series of spirally arranged fine wires, forming the other half of the circuit. The coating on the inner wire is expanded by heat and brought into contact with the outer wires, so that the circuit is closed and a bell rung. Other devices have employed the explosion of powder, the expansion of metallic rods, the breaking of wires, or burning of strings.

HISTORICAL SKETCH. Methods of transmitting news of outbreaks of fire are very old, but the perfection of the electric telegraph was essential to the development of instantaneous and reliable apparatus, which was largely automatic. As early as 1845, Dr. W. F. Channing, of Boston, published an article in the *Advertiser* of that city, outlining a fire-alarm telegraph system. In 1851 the city of Boston appropriated $10,000 for testing the plan, and it was put in operation that year. Dr. Channing and Moses G. Farmer developed the system, which was constructed for Boston by Mr. Farmer, and operated under his direction for several years. In 1857 these men patented the system. John N. Gamewell became interested in the matter in 1855, and by 1869 had acquired the patent rights. Subsequently he did much to improve and introduce the system, but the Civil War, conservatism, and other obstacles were sufficient to prevent its introduction in more than some twenty cities by 1871. New York installed the fire-alarm telegraph system in 1869. In 1875 the number of cities using the system was seventy-five, and since then its increase has been rapid, so that to-day most towns of 10,000 population or over, and many smaller ones, have the fire-alarm telegraph. Although various systems are in use, that devised by Channing and Farmer, and developed and improved by Gamewell and his associates and successors, is the one most generally employed in America. Of the many automatic alarms depending upon either heat or the direct action of flame for operation, there may be mentioned one patented in 1802, in England, by Joseph Smith, where reliance was placed upon the burning of a string. For telegraphy in general, and also a chapter on fire-alarm telegraphy, consult Maver, *American Telegraphy* (New York, 1899).

FIRE-ALARM, AUTOMATIC. See FIRE-ALARM.

FIREARM. A device consisting essentially of a straight tube, provided with means of igniting the charge, which projects a mass of metal or other material through the force of the expanding gases developed by the burning of a charge of gunpowder. Some sort of firearm in which stones were employed as projectiles was in use by the Chinese in the eighth century. By the year 1200 firearms were in use among the Mongols, and there are reports of their use by Genghiz Khan in 1258. The Mohammedan powers, then in the height of their development as regards science and art, seem to have been familiar with the use of firearms in the twelfth century, and had developed practicable small arms in the thirteenth. Early in the fourteenth century cannon came into general use in Europe, and by the end of that century cannon and small arms had become common. See Artillery; Ballistics; Gunnery; Gunpowder; Ordnance; Small Arms, etc.

FIRE-ARMOR. See Fire Protection.

FIREBACK. A pheasant of the Malayan genus Euplocomus, in which all the species have red plumage on the back. See Pheasant.

FIRE-BALL. A projectile designed, when discharged from gun or mortar, to set fire to an enemy's defensive works, or for giving illumination during operations against him. Fire-balls were the successors to the fire-arrow of ancient warfare, and have in turn been superseded by the rocket (q.v.) and other modern inventions.

FIRE-BELLIED FROG. See Feuerkröte.

FIRE-BILL. A paper giving in detail the stations and duties of officers and men of a vessel of war upon the alarm of fire. When the crew of a ship are at their stations as defined in the fire-bill the gathering is known as *fire-quarters.* All precautions are taken against fire, and pumps, hose, and extinguishers are prepared for use.

FIRE-BLIGHT, or **PEAR-BLIGHT.** One of the most destructive diseases of pears, apples, and other pomaceous fruits. While not as regular in its attack as some other plant diseases, no other is more destructive when it does appear. Fire-blight is a contagious bacterial disease due to Micrococcus amylovorus, which gains entrance through the soft tissues of new growth such as twigs and young fruits, through wounds made by insects or otherwise, but especially through the nectaries and stigmatic surfaces of the blossom, from which point of infection the bacteria rapidly spread, killing the tissues as they progress. The leaves are sometimes attacked, but usually they die as a result of the destruction of the twigs, and they remain dried and attached to the branches, forming one of the most striking features of the disease. The part attacked is the cambial layer of the twigs, down which the disease passes to the branches, and finally to the trunk. Its rate of progress is not very rapid, and, when it has run its course, the line of demarkation between sound and dead wood is easily seen. Upon bearing trees the first place of attack is usually in the blossoms, the germs being spread from flower to flower and from tree to tree by bees and other insects. The disease may be recognized by clusters of blossoms turning black. From these the disease spreads. It seems to winter over in infections that have occurred late in the summer. The infected bark is moist, and in the spring gum exudes from the diseased area. This is especially attractive to bees, which carry the germs from the gum to the flowers. Rapid growth of the trees, which may be caused by severe pruning or by too much nitrogenous food in the soil, favors the spread of the disease. Anything that will check the growth of the trees, such as withholding cultivation and nitrogenous fertilizers, should be adopted. The most satisfactory treatment is to cut out and burn all blighted limbs while the trees are dormant. All parts suspected of infestation should be carefully examined and severely pruned back six inches or a foot below the line of separation between sound and diseased wood. The best time to do this is in the autumn, when the contrast between the diseased and sound branches is most striking. A careful inspection of the trees should be made several times during the summer, and all new infections should be cut out and burned. If all pear, apple, quince, crab, hawthorn, and allied plants be looked after in this way, the serious spread of the disease may, to a great degree, be prevented.

For a full account of this disease, consult Waite, in *United States Department of Agriculture Yearbook for 1895* (Washington, 1896).

FIRE-BOAT. See Fire-Engine.

FIRE-BOTE. See Estover.

FIRE-BRICK. See Brick.

FIRE-CLAY. A variety of clay capable of withstanding a high degree of heat. This is because it contains such a low percentage of fluxing impurities such as iron, lime, magnesia, and alkalies. A good fire-clay should resist a temperature of 2900° F., and some will resist 3500°; but, unfortunately, many clays are called fire-clays which are not really refractory. Fire-clays are often plastic, but in the United States especially there exists a non-plastic variety known as 'flint clay.' Fire-clay is found in many geological formations, and in the Carboniferous rocks is often associated with coal. In the United States it is found in large quantities in the Carboniferous rocks of Pennsylvania, Ohio, Missouri, and Kentucky, and in the Cretaceous of New Jersey and other States, especially Colorado. Large quantities are obtained in Germany, England, France, Belgium, Austria, and Russia. Some of the German and Belgian clay is exported to the United States.

The following analyses give the composition of some American and European fire-clays:

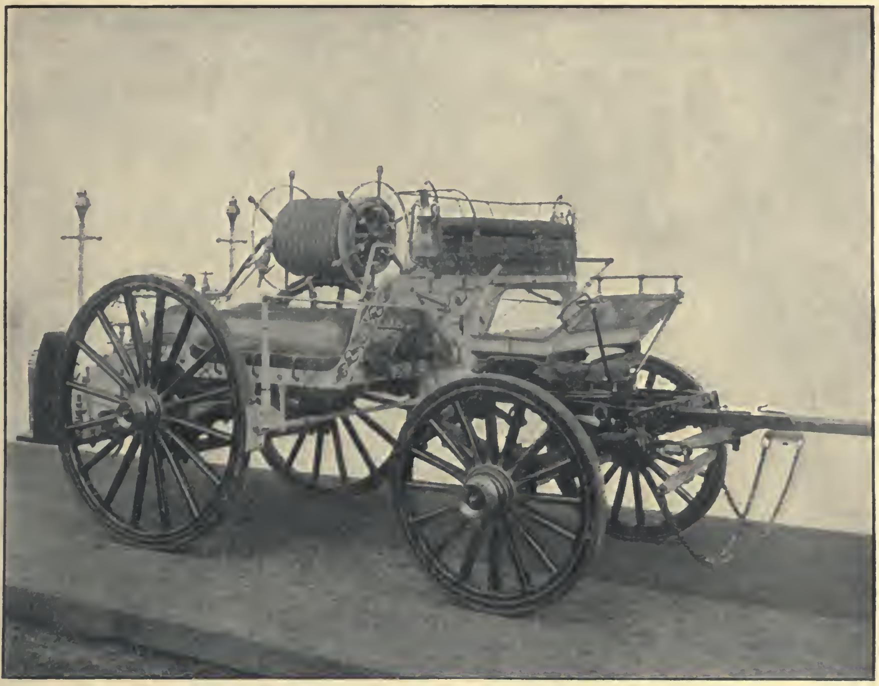
	1	2	3	4	5
Silica	52.58	52.52	46.88	49.75	64.10
Alumina	33.12	31.84	35.42	35.83	22.22
Ferric oxide	.20	.67	1.74	.77	1.92
Lime	....	.27	.44	....	.14
Magnesia	.29	Trace	.20	.11	.18
Alkalies	.08	Trace	1.19	.44	1.10
Water	13.68	14.23	14.10	13.70	7.10
Titanic acid	....	....	....	1.10	1.00

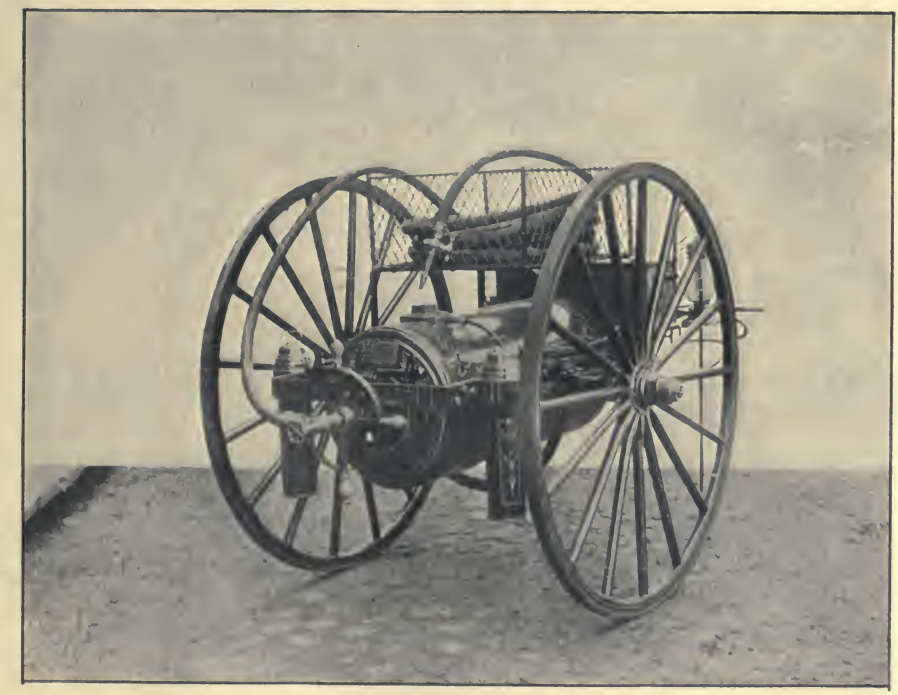
1. Flint clay, Hunker Station, Pa. 2. Flint clay, Mineral Point, Ohio. 3. Golden, Colorado. 4. Woodbridge, New Jersey. 5. Stourbridge, England.

Fire-clays are used in the manufacture of fire-bricks, gas-retorts, glass-pots, assayers' furnaces, crucibles, and other objects which in their use are subjected to a high degree of heat.

Among the varieties recognized are: *Flint clay,* a hard form, resembling flint in appearance and lacking plasticity, found in the same bed with plastic clay; *ganister,* a refractory clay having

FIRE ENGINE





CHEMICAL FIRE ENGINE (UPPER)

HAND CHEMICAL FIRE ENGINE (LOWER)

a high percentage of silica; *pot-clay*, a fire-clay burning dense at a low red heat, but otherwise refractory, used in the manufacture of glass-pots; *fire-mortar*, a sandy fire-clay used for making mortar to set fire-bricks; *retort-clay*, a very plastic refractory clay used in the manufacture of gas-retorts. Consult: Bishof, *Die feuerfesten Thone* (Leipzig, 1895); Ries, article on "Clay," in *The Mineral Industry*, vol. ix. (New York, 1901). See CLAY; COAL.

FIRE-CREST. A British kinglet (*Regulus ignicapillus*), more fully called 'fire-crested wren,' and also 'goldcrest.' See KINGLET.

FIRE-DAMP. The miners' term applied to light carburetted hydrogen or coal-gas, when it issues from crevices in coal-mines. It is sometimes improperly called 'sulphur.' When mixed with 5½ to 14 parts of air, it forms an explosive mixture whose ignition is the cause of many accidents in mines. The gas formed by this combustion is known as 'after-damp.' See MINE GAS; METHANE.

FIRE DANCES. Dances performed around the fire, generally at night. Fire is almost universally associated with the home and hence with the family, and in the course of religious evolution the fire dance has gradually gained in importance. Whereas in Vedic India, for example, we find the rite as a fertility-charm performed at the solstice, among the American Indians it has developed into forms of war-dances, of which the most important is the scalp-dance. In Australia the Corroberee, performed in elaborate costumes, marks a further step toward the purely mimetic dance, and prepares the way for pantomimic drama, the earliest form of the art, as it is found among the aborigines of that continent. Rising higher in the art scale, the fire-dance becomes a simple recreation of more or less elaborate character, as is typified in dances around ordinary bonfires. A highly developed form of the fire-dance exists on the modern stage where the firelight is represented by calciums of different colors. See FIRE WORSHIP; SKIRT DANCES.

FIRE-EATING. A name usually given to a variety of feats performed by jugglers with flaming substances, melted lead, red-hot metal, etc. Many feats of this kind are undoubtedly mere tricks, or illusions, produced by sleight of hand; others are capable of scientific explanation. There is nothing more wonderful in stuffing blazing tow into the mouth—a common form of mountebank fire-eating—than in eating flaming plum pudding, or in dipping the finger into spirits and letting it burn like a candle. It is also well known that the tongue or the hand, dipped in water, may be rubbed with impunity against a white-hot bar of iron; the layer of vapor developed between the hot metal and the skin prevents contact and produces coolness. Certain kinds of these performances are explained by the well-known power of the living body to maintain its normal temperature for a time, independently of the external temperature.

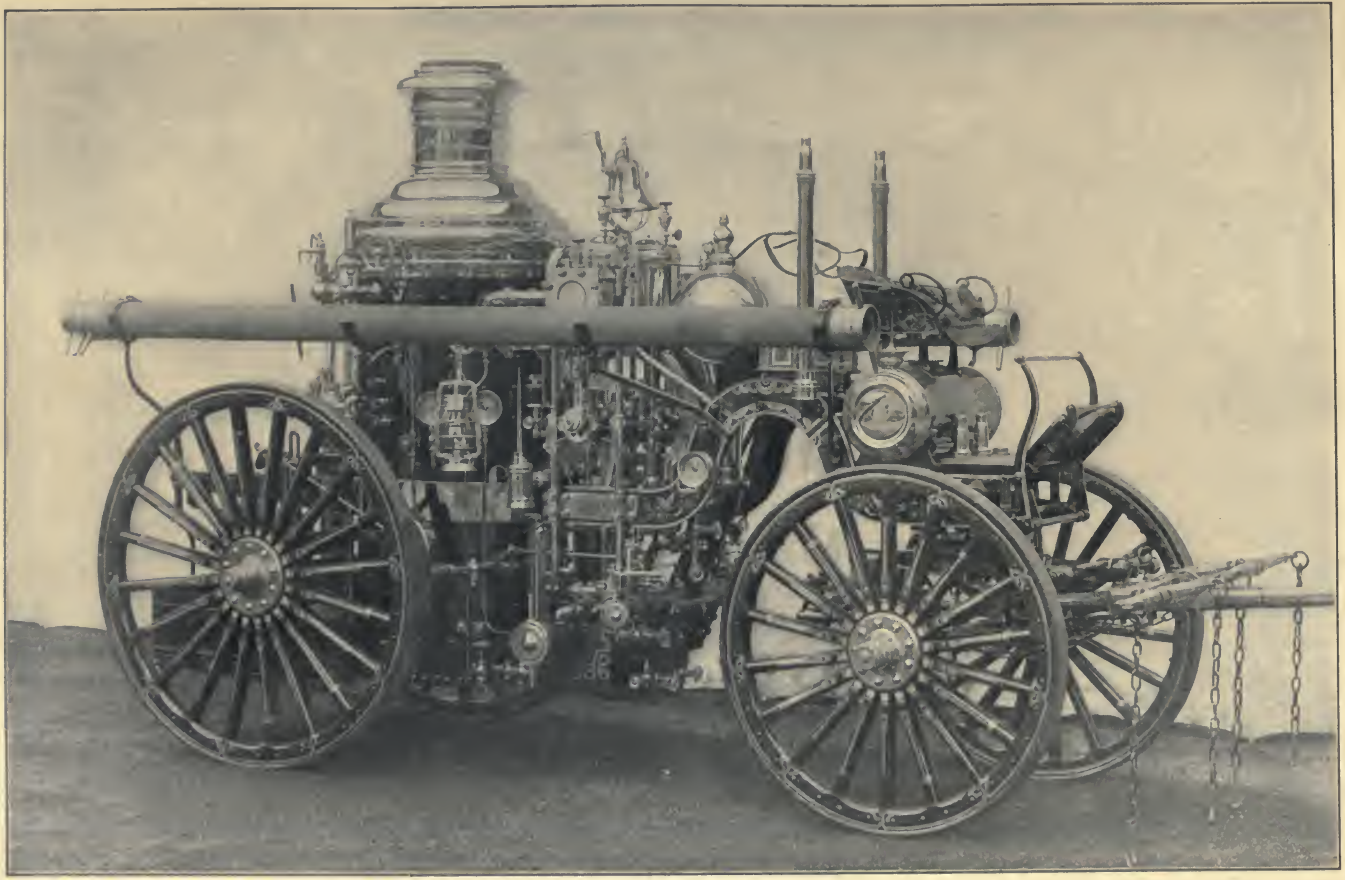
FIRE-ENGINE. A machine employed for throwing a jet of water for the purpose of extinguishing fire. Machines for the extinguishing of fires have been used from a very early date. They were employed by the Romans, and are referred to by Pliny; but he gives no account of their construction. Apollodorus, architect to the Emperor Trajan, speaks of leathern bags, with pipes attached, from which water was projected by squeezing the bags. Hero of Alexandria, in his *Treatise on Pneumatics* (written probably about B.C. 150), proposition 27, describes a machine which he calls 'the siphons used in conflagrations.' It consists of two cylinders and pistons connected by a reciprocating beam, which raises and lowers the pistons alternately, and thus, with the aid of valves opening only toward the jet, projects the water from it, but not in a continuous stream, as the pressure ceases at each alteration of stroke.

A device with two pumps, worked by levers, is said to have been invented in Egypt in the second century B.C. Apparatus called 'instruments for fires' and 'water syringes useful for fires' are described in the building accounts of the city of Augsburg, 1518. In 1657 Kaspar Schott described a fire-engine used in Nuremberg, apparently similar to that described by Hero. It had a water-cistern, was drawn by two horses, was worked by 28 men, and threw a jet of water an inch in diameter to a height of 80 feet. It was not until late in the seventeenth century that the air-chamber and hose were added, the first being mentioned by Perrault in 1684, and the hose and suction-pipe being invented by Van der Heide in 1670. In England small brass hand squirts were used up to the close of the sixteenth century. Paris had fire-engines of some sort at the beginning of the eighteenth century. In England, in 1734, engines of various construction were manufactured, the most successful of which was that invented by Newsham. Two of his machines—the first invention of the kind ever used in this country—were introduced in New York in 1731. It was more than fifty years after this that the leather valves within the cylinders were superseded by metallic valves, placed in valve-chests apart from the cylinders and the air-chamber. Rotary and semi-rotary pumps were also introduced. Floating fire-engines worked by hand were used on the Thames before the close of the eighteenth century. In some cases the mechanism that worked the pumps was used to move the paddle-wheels. It was not until 1850 that floating fire-engines worked by steam came into use in England.

So far as known, the first steam fire-engine was developed by Brathwaite in 1829 or 1830. John Ericsson (q.v.) worked on the problem about the same time, and is credited by one writer as having built such an engine with Brathwaite, in London, in 1830, and also with having built one in New York in 1840, very soon after he had come to America. In 1841 an engine was built in New York after plans by Hodge, probably as the result of a competition after the great fire of 1835. This engine was operated occasionally by or for insurance companies, but neither it nor the earlier London engine was satisfactory. In 1850 A. B. Latta, in Cincinnati, produced the first machine which was practically useful. Cincinnati was the first city in the United States to organize a steam fire department, but other large cities and towns rapidly followed the example. In 1872 self-propelled steam fire-engines were delivered to both New York and Boston; and in 1873 one was delivered to Detroit—all of the Amoskeag make. From 1872 to 1898 about twenty similar engines were bought by American cities. Recently a new impetus has been given to the idea of self-propelled fire-engines and other fire-department apparatus, but only a few had been built up to 1901; nor can their introduction be rapid until motor vehicles become as reliable as the marvelously trained horses of American fire departments. Hand fire-pumps, drawn by men or horses, were used prior to the advent of the steam-engine, and are still employed in some small towns. They have been brought to a high degree of perfection for a machine of that nature, and are manufactured in a variety of styles and at low prices.

The main parts of the steam fire-engine are the boiler, engine, pumps, and the vehicle on which these are mounted. Boilers are generally of the vertical water-tube type. The engines and pumps are also generally vertical, double-acting, and in duplicate. A few makes have both rotary steam and water cylinders, instead of the more common steam-pistons and water-plungers or reciprocating engines. Some light machines have horizontal engines and pumps. To facilitate the preparation of fire-engines for service, heaters are maintained in the engine-house to give a constant supply of hot water to the engines. When the alarm strikes the fire is kindled beneath the boiler, and steam is soon available. The rated capacity of steam fire-engines ranges from about 1300 to 400 gallons per minute, and their weights from 9500 to 5000 pounds. The self-propelled engines already mentioned, as now built, have a capacity of 1350 gallons per minute, and weigh 17,000 pounds when equipped for service. They are 10 feet high, 16½ feet long, and 7¼ feet wide. The engine is propelled on the road by power from the main crank-shaft, through two chains running over sprocket wheels on the main rear wheels of the engine. The driver steers the engine by means of a hand wheel and rod connected with the front axle through a bevel and worm gearing. By the removal of a key the road-driving mechanism may be disconnected, whereupon the power becomes available for the pumps. One of these engines, made for the city of Hartford, Conn., when on its first trial is reported to have thrown a stream through 50 feet of 3½-inch hose to a horizontal distance of 348 feet with a 1½-inch nozzle, and 319½ feet with a 2-inch nozzle. The first, and for many years probably the only thorough test of steam fire-engines, was that made in 1876 at the Centennial Exhibition at Philadelphia. The results are given in detail in the official report of the exhibition, together with descriptions of the several engines. A more recent series of tests was made at Boston in 1893; both the conditions and the results obtained are given in detail in the report of the city engineer of Boston for 1893-94. The engines tested were those in regular service by the fire department, some practically new and others fifteen years old. In all cases the engines drew water from a hydrant under pressures of from 30 to 40 pounds. The largest average quantity of water pumped per minute during the whole of one test was 910 gallons, by a Clapp & Jones engine, the pumps having been run two hours and twenty-three minutes and throwing a total of 130,121 gallons of water. The average steam-pressure was 101.3 pounds, and the average water-pressure at the pumps was 112.8 pounds. For shorter periods during this test better results were obtained; thus, for about twelve minutes there was a discharge of 1022 gallons per minute. It must be understood that various combinations of hose, both as to length and the number of lines, and nozzles of different sizes, were used; but even with three lines of hose, each 500 feet long, two of which were 2½ inches in diameter and had 1⅛-inch nozzles, while one was 3 inches in diameter and had a 1¼-inch nozzle, an average discharge of 900 gallons per minute was maintained for sixty-four minutes, with water-pressure of 53.5 pounds at the nozzles. As stated, the pumps ran two hours and twenty-three minutes altogether, but the engine was under steam for three hours and eight minutes, during which time 2869 pounds of coal were burned and 8398 pounds of water evaporated. This was 2.93 pounds of water per pound of coal, or 3.51 pounds from and at 212° F. The coal used per square foot of grate per hour was 172.1 pounds, and the duty in foot-pounds was 7,758,300 per 100 pounds of coal—i.e. for every 100 pounds of coal burned 7,758,300 pounds of water was raised to an equivalent of 1 foot in height. This engine weighed 7970 pounds, had steam-cylinders 9 inches in diameter, water-cylinders 5½ inches in diameter, both of 8-inch stroke. Its boiler was 35½ inches in diameter, with a heating surface of 140½ square feet. The other engines in this Boston test were all smaller, having steam-cylinders from about 6 to 8½ inches in diameter, 4 to 5 inch water-cylinders, but with about the same length of stroke as the more powerful engine. Their calculated capacities ranged from about 500 to 700 gallons per minute, and their average work during the tests was the throwing of 499 to 596 gallons of water per minute. The duties of these engines ranged from 5,882,000 to 14,026,000 foot-pounds per 100 pounds of coal, and the water evaporated from and at 212° F. ranged from 2.26 to 5.87 pounds per pound of coal. The range of duties was about 10 per cent. as great as that of fair to high grade stationary pumping engines; but it must be understood that fuel economy is a secondary matter in a fire-engine, the main object being to get the engine to the fire and throw the maximum of water in the minimum of time after the alarm. To enable the engines to be drawn by horses at a high rate of speed, lightness is essential. Fire-engines mounted on fire-boats, like those used by New York, Detroit, and other cities, may be designed with less regard for weight and with more consideration for fuel economy; but here, also, quickness and effectiveness of service ranks first, so the chief advantage of such fire-engines is that they may be made practically as capacious and powerful as is desired, and may approach fires closely from the water-front side, where the ordinary steam fire-engine cannot be driven. The fire-boat *Robert A. Van Wyck,* for the New York Fire Department, put in use in April, 1898, has two sets of pumps, which on test delivered about 3200 gallons of water per minute each, with pump pressures of about 180 pounds. The fire-boat *Deluge,* built in 1900 for the city of Detroit, was designed to have two sets of vertical, triple-expansion pumping engines, with 14-inch steam and 8-inch water cylinders, all of 11-inch stroke, and with a combined capacity of 6000 gallons per minute. Two huge nozzles were included, besides 20 connections for 3½-inch hose. Besides steam, gasoline engines are sometimes used for driving the pumps of portable engines,

FIRE ENGINE



AMERICAN MODEL OF 1902

being designed particularly to replace the small hand-worked fire-engines used in villages.

Chemical fire-engines and extinguishers range all the way from apparatus mounted on wheels and propelled by horses or men to small tanks carried on a fireman's back, or small hand force-pumps. The aim of all such devices is to smother the fire by means of some gas, such as carbonic-acid gas. The larger and more effective apparatus include a generating tank or tanks, in which water and soda are placed, with an agitator to aid in dissolving the soda, an acid-feeding chamber, and the necessary hose. If the generating apparatus is in duplicate, with proper hose connections, continuous streams may be thrown; otherwise the stream will cease while recharging is in progress. The water serves as a medium to carry the gas, and the gas is the motive force for the water. Small quantities of water are required, as compared with fire-engines, thus permitting a relatively light apparatus and small and easily managed hose. For incipient fires, or some of those where water is inefficient, the chemical apparatus is very useful, and it may be employed to advantage in some cases where the cost of steam fire-engines is prohibitive. It is considered advantageous to combine the chemical engine with an ordinary hose-wagon, and thus cope with small fires in an effective and satisfactory manner. See FIRE-EXTINGUISHER. For further information on fire-engines, see FIRE PROTECTION, MUNICIPAL.

FIRE-ESCAPES. A stationary or portable device to enable people to escape from burning buildings when ordinary means of egress to the ground are destroyed or cut off by flames. The standard fire-escape used in America, and required by most city building laws, consists of balconies attached one above another to the outside of the building, connected by iron ladders with each other, and opening onto each floor at a door or window. Such fire-escapes are made entirely of iron, and one or more of them may be used according to the size of the building. Portable fire-escapes may be operated from the interior of the building or from the outside, according to their character. Interior fire-escapes of this class vary in character from a simple knotted rope placed in each room, and down which the person seeking escape slides, to more elaborate devices, like canvas tubes, cables with slings, etc. The variety of such devices which have been patented and placed upon the market is enormous. Portable fire-escapes operated from the outside consist of ladders, telescopic tubes carrying slings, cables which may be thrown up into open windows, etc. One of the most practical and effective of all of these devices is a simple ladder of sufficient length to reach from one story to the next, and provided with large hooks at one end which may be inserted over the window-sill. The first ladder is placed from the ground, the second from the top of the first, and so on until a line of ladders extends from the ground to the top floor, down which the occupants of the building may descend alone or be carried by the firemen. The efficiency of all these devices in saving life depends largely upon the coolness and self-possession of the endangered persons and those who are trying to aid them, and upon the device being maintained in working order, a matter that is often neglected. For these reasons various authorities on fire protection are coming more and more to advocate that reliance on safety from fire should be placed on fireproof construction aided by the use of stationary fire-escapes of the first kind described.

FIRE-EXTINGUISHER, or FIRE-ANNIHILATOR. An apparatus by means of which fire may be extinguished, usually by pouring on it water charged with some gas that is incapable of supporting combustion, especially carbonic-acid gas (q.v.). An extinguisher of this character was originally brought into successful use in London in 1816, and a patent was applied for in the United States for a similar apparatus by William A. Graham in 1837. These extinguishers are of various forms and shapes, and consist for the most part of a convenient reservoir of water, within which are two small vessels, one containing some carbonate, and the other a strong acid. When the apparatus is to be used the contents of the smaller vessels are emptied into the water; the carbon dioxide liberated from the carbonate by the acid is then partly taken up by the water, and the pressure created by the confined gas forces out the solution in a strong jet when the vessel is opened. The Babcock extinguisher, which has been extensively used in the United States, consists of a cylindrical vessel which may be carried on the back, filled with a solution of sodium bicarbonate, over which is suspended a vessel containing sulphuric acid, which is made to tilt over and discharge its contents into the solution when brought into use, thus liberating the carbon dioxide. Large cylinders containing chemical salts, as previously described, have been mounted on wheels, known as 'chemical fire-engines,' and are used in many of the larger cities. (See FIRE-ENGINE.) For the extinguishing of fire on shipboard a series of pipes have been arranged on the upper deck that communicate with the various compartments of the vessel, as the coal-bunkers, the hold, the main deck, etc. Chemical agents are placed in the receptacle to which steam may be admitted, and in case of fire the steam mingles with the carbon dioxide and the two are conveyed to the place of danger, where they replace the air, smother, and finally extinguish the fire. Similar arrangements, some of which are automatic, being made to act when the temperature rises to the danger point, are in use in factories.

Hand grenades, or bombs filled with fire-extinguishing solutions of chlorine or ammonium chloride, borax, carbonic-acid gas under great pressure, mixtures of calcium chloride, magnesium sulphate, sodium carbonate, sodium chloride, and sodium silicate, are in common use; but they are of value only in the first stages of a fire. See FIRE-ENGINE.

FIREFLY. The name of many luminous beetles of the families Lampyridæ and Elateridæ, the former of which is known as the firefly or lightning-bug family. The Lampyridæ are pentamerous beetles of small size and soft texture, with the head frequently hidden under the prothorax, but sometimes prominent and with serrate antennæ; the elytra are soft and yielding, are often abbreviated, and in some genera totally wanting in the females, which are wingless, and larvæ-like in other respects. These and the true larvæ are called glowworms, and are often more luminous than the adult male lightning-bugs. "The larvæ are flattened, often dark-colored and velvety, and have an ocellus on each side of the retractile head; they are generally carnivorous, living under stones and bark, and upon the ground, where they devour snails and larvæ of insects. Sometimes the velvety larvæ of certain species of Telephorus wander about upon the snow, giving rise to stories of showers of worms."

The family Lampyridæ is confined to warm or tropical lands, and is very abundant in southern Europe and in most parts of the United States. Fireflies are gregarious, and their luminosity is most evident on warm, dark nights. The light-giving part is situated ordinarily on the sides of the abdomen, and the light is greenish-white, like phosphorescence; but in South America there is a remarkable form, probably a female of the group Phengodini, which flashes a red light at each end of the body and a green light along the sides, suggesting signals, so that it is known in Paraguay as the railway beetle. The emission of light by the lampyrid lightning-bugs and glowworms is intermittent, but at definite intervals, in one case averaging about thirty-six flashes a minute, but this varies a little from night to night, perhaps with the temperature. The function of the light of Lampyridæ is unknown to us, but since many of the fireflies have unusually well-developed eyes, and since most of them are active at night, the flash would seem in some way to be important for the firefly. In some forms (as Pyrophorus) not only both sexes, but the eggs, larvæ, and pupæ are luminous. A common species of lampyrid firefly in the eastern United States is *Photuris Pennsylvanica,* about half an inch long, yellowish and obscurely striped; its luminous larva has a brush-like anal leg. A Western species is *Photuris pyralis,* which has brownish-black elytra margined with dull yellow, and whose larvæ live in the ground and feed upon worms. The most familiar European species is the common glowworm of England (*Lampyris noctiluca*), of which the blackish female, half an inch in length, is entirely wingless and without elytra, and crawls about in the grass emitting a soft, steady light, occasionally interrupted. The males and the larvæ are also faintly luminous, the latter being noted for their voracity and their devouring of snails. In another genus, plentiful in southern Europe, both males and females are winged and luminous, the male giving a stronger light than the female.

Luminous Elaters. The second family that contains luminous beetles is the Elateridæ. These give forth at will a steady light, and are all tropical American beetles of the genus Pyrophorus. There are about 100 species of this genus, but not all are luminous. These wonderful insects were seen and described by some of the early explorers of America, but even to-day only one form, the cucuyo (*Pyrophorus noctilucus*), has been studied. It has two yellowish 'eye-like lamps' on each side of the prothorax through which light shines. The ventral surface of the abdomen is also strongly luminous; but this light is only evident when the insect is in flight. These beetles are frequently used as ornaments for the hair, especially in Vera Cruz. They are blackish-brown and nearly two inches in length, so that one may believe the report that the Indians sometimes use them as lanterns.

The firefly produces light practically without loss of heat or chemical rays, but concerning the method of the production of this most economical light we know little. An account of what has been learned of the nature and purpose of this luminosity will be found in the article Luminosity of Animals.

FIRE INSURANCE. It is impossible to determine just when a scientific system of insurance against loss by fire was first introduced. The principle of mutual aid in times of distress was embodied in many societies both in ancient and in mediæval times, and one of the generally recognized occasions for such aid arose when the property of a member was destroyed by fire. In the ordinances of the guilds of the later Middle Ages, for example, we find regulations for the payment of a certain amount of indemnity to any member who suffered loss of property by fire. This amount was sometimes paid out of the funds of the guild, and was sometimes raised by a specific assessment on the other members. In neither case were the essential principles of insurance observed. There was no separation of the insurance fund from the other funds of the guild, and no payments to the guild by the members based on the risk which the guild assumed. The indemnity bore no definite relation to the amount of loss, or to the amount which the members had paid to the guild, but was either fixed beforehand as a uniform sum or a uniform contribution from each member, or else was arbitrarily fixed by the guild itself after the loss had occurred.

England. The earliest recorded proposal for the establishment of a scientific fire-insurance company in England was made in 1635. The first office was opened by N. Barbon, in London, in 1667, the year after the great fire. It is highly probable that the business had already been introduced on the Continent. Barbon's method was that of individual underwriting. The first joint-stock association for insuring against loss by fire was established in 1681. The oldest surviving English company, the Hand in Hand, was founded in 1696. No less than five other existing English companies date back to 1720 or earlier.

United States. The first fire-insurance company in the United States was opened at Philadelphia in 1752, and incorporated in 1768. It was called the Philadelphia Contributionship for the Insurance of Houses from Loss by Fire. Benjamin Franklin was one of its first directors. This company still survives. It is a mutual company, and writes only perpetual risks. Its business is confined to the State of Pennsylvania. The development of the fire-insurance business was slow at first, being greatly retarded by the financial and industrial disturbances due to the Revolution. Before the end of the eighteenth century, however, at least thirty charters had been granted to companies for carrying on the business. Among the oldest existing companies may be mentioned the Insurance Company of North America and the Insurance Company of the State of Pennsylvania, both located in Philadelphia and both incorporated in 1794; the Mutual Assurance Company of the City of Norwich (Conn.), which began business in 1795; and the Providence Washington Insurance Company, of Providence, R. I., incorporated in 1799. The oldest existing New York company was organized in 1806, and the oldest Massachusetts company in 1818. Thousands of charters have been granted to fire-insurance companies since the beginning of the nineteenth century, but many of them have never been used. In a general way the number of new companies established from year to year has varied with the general prosperity of the country, and every period of depression has seen the failure or withdrawal of a number of companies. The most trying time in the history of fire insurance in the United States during the last fifty years came in the early seventies. In October, 1871, as a result of the Chicago fire, insurance companies became liable for indemnities amounting to more than $96,500,000. In November of the following year occurred the great Boston fire, which brought a loss of more than $52,600,000 upon the companies. These two great losses, coming in quick succession, subjected all fire-insurance companies to great strain. More than a hundred of them were forced to suspend operations, while many others found their surplus wiped out and their capital seriously impaired. While there has been no such wholesale slaughter of companies since that time, there have been many isolated cases of failure. It is estimated that in the nineteenth century not less than one thousand fire-insurance companies perished, entailing very great loss upon insurers and insured alike. On the whole, however, the history of the century, and especially of the second half of it, shows a nearly constant growth in the magnitude of the fire-insurance business, and a steady improvement in the financial standing of the companies. During the latter part of the century the establishment of governmental supervision of insurance companies in many of the States, involving periodical reports from each company, and thus a great degree of publicity as to its financial condition, has done much to prevent reckless management on the part of the companies and to protect the interests of the insured.

It is impossible to obtain complete statistics of the number of fire-insurance companies in the United States, or of the amount of business they transact. In a number of the States certain companies, especially the small mutuals, are exempted from the duty of reporting to the commissioner, and statistics about such companies are nowhere attainable. There are probably in the United States at the present time nearly or quite 2000 companies granting insurance against fire. Of this number, however, only about 150 are of any considerable size or operate over a large territory. The total amount of fire insurance carried by all the companies is probably not far from $30,000,000,000. The average rate of premium in 1901, according to the tables presented at the meeting of the National Board of Fire Underwriters in May, 1902, was practically $1.08 for each $100 of insurance. This rate fluctuates considerably, the figures for the decade 1891-1900 showing a maximum of $1.12 in 1894, and a minimum of $0.99 in 1899. Profits for the decade, as shown by the dividends declared, have been fairly uniform. The lowest average annual rate during the decade was 10.43 per cent., in 1893; the highest, 11.65 per cent., in 1899. In seven of the ten years the average rate exceeded 11 per cent.

Some indication of the increase in the use of fire insurance by property-owners may be gained from a comparison of the total fire loss for different periods with the losses sustained by the insurance companies during the same periods. The figures given in the *Spectator Year Book* for 1902 indicate that in the decade 1881-1890 57.4 per cent. of the total fire loss was covered by insurance, while in the decade 1891-1900 60.9 per cent. of the total loss was thus covered. The following table, compiled from the reports made to the Insurance Department of the State of New York by companies operating in that State, may serve to illustrate the growth of the business during the last forty years of the nineteenth century. It must be remembered, however, that the actual growth has been greater than these numbers indicate, owing to the increase in the proportion of companies in the West and South which make no report to the New York Department:

YEAR	Risks in force Dec. 31st	Premiums	Losses
1860	$1,466,954,382.57	$14,436,869.76	$ 8,570,956.74
1865	2,564,112,505.00	25,419,588.00	17,264,617.00
1870	4,149,473,784.00	37,916,965.23	22,476,300.70
1875	6,039,507,339.00	59,285,105.00	27,695,628.00
1880	7,305,729,981.00	61,126,535.51	43,243,439.94
1885	10,517,940,175.00	81,251,444.00	47,753,787.00
1890	15,272,785,000.00	104,706,417.51	57,026,230.29
1895	17,657,994,301.00	122,599,676.88	68,369,563.71
1900	22,352,562,553.00	141,232,031.75	89,566,349.00

ORGANIZATION. STOCK COMPANIES. Nearly all the fire-insurance companies in the United States are organized either as mutual companies or as joint-stock companies. There are a few organized as unincorporated associations of individuals, transacting business on the principle of the English Lloyds. The mutual companies are more than five times as numerous as the joint-stock companies, but the risks carried by the relatively small number of stock companies are many times as great in amount as those carried in the mutual companies. The relation of the insured to the stock company is simple and definite. By paying the stipulated premium he becomes entitled to indemnity in case of loss by fire within a given time. He incurs no liability, but substitutes a certain and definite periodical payment for the possibility of a loss of uncertain amount. It is probably the element of certainty and definiteness that gives the stock companies a large part of their advantage over the mutual companies.

MUTUAL COMPANIES. The relation of a person insured in a mutual company to the company is by no means so simple as in the previous case. In the simplest form of mutual insurance the funds necessary to pay losses are raised by assessment after the losses have occurred. Under such a system neither profit nor loss can arise, as the assessments are made to cover only loss and expenses. Experience has shown, however, that it is extremely difficult to raise the required amount in this way, whenever losses are unusually heavy. The general custom among the older mutual companies at the present time, therefore, is to collect a part of the necessary funds by premiums paid in advance, and to hold the insured responsible for such additional amounts as may be required to pay losses. The liability of the insured is, however, frequently limited to a certain amount, or to a certain proportion of the cash premium. This liability varies in different companies from a sum equal to the premium to a sum equal to five times the premium, and occasionally to an even greater sum. Many of the older companies have accumulated large surpluses, out of which they are able to pay any exceptional losses they may suffer, and in normal years to return to the insured in the form of dividends a very considerable part—not infrequently as high as 90 per cent.—of the sum collected as premiums. In the Western States in recent years the mutual principle in fire insurance has manifested itself in the establishment of numerous 'town' and 'county' mutual companies. The activity of these companies is usually limited to a single town or county. They are very largely engaged in insuring the property of farmers. They act on a plan somewhat different from that of the older Eastern companies. Instead of keeping up rates, and using the annual gain to accumulate a surplus or to increase dividends, they establish comparatively low rates. On long-time insurance usually a small part of the premium is paid in cash and the rest is paid by premium notes, The liability of the insured is limited to the amount of the notes given by him. No payments have to be made on these notes unless the losses of the company compel it to make an assessment. At the expiration of the term of insurance the notes are canceled. In many of the States the companies are authorized to count these premium notes as the whole or a part of the legal reserve, and they are to that extent freed from the necessity of accumulating a cash reserve sufficient to reinsure outstanding risks.

Lloyds. In the early nineties there were organized in the United States a large number of fire companies on the plan of the English Lloyds. Most of these companies were located in New York, where a special provision of the insurance law gave them a temporary advantage. A 'Lloyds' is neither a joint-stock company nor, in most cases, a mutual company; it is rather a partnership with limited liability. It is an unincorporated association of individuals, each of whom deposits a certain amount, and assumes liability for a limited additional amount. In the English Lloyds, where marine insurance is written, each member of the association does his own underwriting, specifying how much, if any, liability he will assume on each risk offered. In the United States companies, on the other hand, the actual management of the business is put in the hands of an attorney, who writes the insurance. Each member of the association incurs liability on every risk written, in proportion to his share in the deposit fund. In case of loss the deposit fund, and, if necessary, the additional liability of the subscribers, may be drawn upon to meet it. There is no reason in the nature of things why an insurance company so organized should not be as strong as a stock company. As a matter of fact, the stability of the English Lloyds is above question. The essential thing is financial responsibility on the part of the members of the association. In a great majority of the American companies this has been lacking. Not only was the additional liability assumed by the members usually of no value, but the deposits themselves were frequently in the form of notes, on which it was found impossible to realize in case of need. In New York the Lloyds survived in large numbers only so long as they were able to escape the supervision of the Insurance Department. As soon as they were brought under the provisions of the General Insurance Law, most of them disappeared. Of the 125 companies in New York in 1895, not more than 15 were surviving in 1901. During the last few years, however, Lloyds have been appearing in considerable numbers in Chicago under the lax provisions of the Illinois insurance law. A person inclined to seek insurance in the Lloyds, on account of the low premium rates offered, needs to remember that unless the company is organized in a State in which the Lloyds are under careful supervision by the Insurance Department, he has no assurance of the stability of the association. The actual value of the assets of the company may be far below the nominal value. Moreover, as the association is not a corporation, a person having occasion to bring suit against it must resort to the courts of the State in which the association is located.

Foreign Companies. Foreign fire-insurance companies, chiefly British and German, write a considerable amount of business in the United States. Many of the States have laws requiring a deposit by foreign companies of other States before licensing them to do business in their borders. Several of the foreign companies have found it advantageous to do the whole or a part of their American business through subsidiary American companies. Sometimes such a company is directly established by the foreign company; sometimes the foreign company buys up an already established American company. More than fifty foreign companies are operating in the United States, and probably write nearly, or quite, a quarter of the entire fire business of the country. Though these companies, in common with American companies, have suffered from the unusually heavy fire losses of the last few years, for the ten years from 1892 to 1901, inclusive, they sent to their home offices some $20,000,000 more than they received from them. The excess amounted to $4,367,000 in 1896, fell to $131,000 in 1900, and in 1901 was replaced by a net importation of $486,000. Partly in consequence of the unfavorable results of the business of the last few years, and partly on account of the tendency in some States to discriminate against the foreign companies, many of these companies show a disposition to contract rather than to expand their American business. Only two States—Connecticut and Kansas—actually discriminate between foreign companies and companies of other States. In Kansas the tax is 4 per cent. on the gross premiums of the former, and 2 per cent. on similar premiums of the latter; Connecticut imposes a tax of 2 per cent. on gross premiums of foreign companies, and has for other-State American companies the reciprocal provision. But while the actual legislative discrimination against the foreign companies is not very widespread or very severe, the possibility of such legislation, and the somewhat common advocacy of it, tend to drive the companies away. Five such companies withdrew from the United States, either wholly or in part, in 1901.

Self-Insurance. When many pieces of property so situated as to constitute separate risks are owned by a single individual or corporation, the proprietor sometimes finds it cheaper to 'carry his own insurance' than to have recourse to an insurance company. When a corporation adopts this plan of self-insurance, it usually sets aside an insurance fund, out of which any property destroyed by fire is to be replaced. The losses which are suffered fall wholly on the corporation; the insurance fund merely enables it to meet them without embarrassment. The prevalence of this custom of self-insurance against fire among large corporations constitutes a serious indictment of the management of fire-insurance companies. A part of the gain from a system of insurance comes from combining many separate risks in a single company, since the more risks the company carries (provided, of course, they are properly classified) the less fluctuation will there be in the amount of loss, and the smaller the reserve which will have to be maintained to prepare for unexpected losses. Consequently, however many risks of its own a corporation may be carrying, it should be to its advantage to combine them with as many other similar risks as possible. That so many large corporations find it cheaper to carry their own insurance can be explained in only one way —that the insurance companies charge more for the protection they give than is justified by the risk they assume. A slight extension of the principle of self-insurance is seen in the strictly mutual insurance companies often formed, composed of a small number of persons all engaged in some one line of business. Perhaps the best-known example of this kind of company is to be found in the so-called 'mill' or 'factory' mutuals of New England. Such a company consists of a limited number of persons or corporations engaged in some particular line of manufacture—as, for example, the cotton manufacture—each of whom insures the whole or a part of the value of his mill in the company. Nearly all of these companies are very stringent in their requirements as to the protective measures to be adopted by their members. The adoption of these measures greatly reduces the danger of loss by fire, and so lessens the degree of risk. These companies, however, like individuals, should be able to insure more cheaply in large insurance companies, if those companies charged no more for the business than the risk justified.

The Agency System. While fire-insurance companies were small and their activities were confined to limited areas, it was possible for all the business of any one of them to be done through a single office. With the growth of the business and the extension of the field of operation of the larger companies, the single-office system became cumbersome and unwieldy. To meet the difficulty, the 'agency system' was introduced, for a time tentatively and to a limited extent. It was first tried successfully on a large scale in the early fifties, by the Home Fire Insurance Company. It has since become practically universal among the large companies. Under the agency system the territory constituting the field of operation of an insurance company is divided into a number of departments, varying for the whole United States from two or three to ten or twelve in number. Over each department is a general agent or manager, who is practically in charge of the business of his company throughout his department, subject to the general instructions received from the home office. The manager appoints and supervises two classes of subordinate agents—local agents, one or more in each locality where the company does business, and special agents, usually one for each State. The local agent is the one who solicits business and actually writes the insurance, making periodical reports to the general agent in charge of the department which includes the locality in which he works. That the local agent may have the greatest incentive to diligence in securing business, his remuneration takes the form of a commission on the premiums received. This method of payment has the disadvantage of putting the agent under a strong temptation to accept undesirable risks, or to secure business by improper methods, for the sake of obtaining his commissions. It is one of the chief functions of the special agent, or 'field man,' to keep watch over the local agents, and prevent them from sacrificing the welfare of the company to their own pecuniary interests. The special agent is paid a salary instead of commissions, and his chance of promotion lies in making a good showing for his district. His interests coincide with the interests of the company he represents.

That the agency system has been largely responsible for the great extension of fire insurance in the United States cannot be doubted. The method is, however, a very costly one. The direct cost in the form of commissions is enormous, and is increasing from year to year. Thus, for the fire insurance written in the decade 1861-70, commissions amounted to $11.21 for every $100 of premiums; in 1871-80 they were $14.61 per $100 of premiums; in 1881-90, $17.89; in 1891-1900 they varied from $17.90 in 1894 to $20 in 1900; and they went still higher in 1901, to $20.75. Of the $150,000,000 received in premiums during that year by the agency fire-insurance companies, more than one-fifth, or more than $30,000,000, was immediately handed back to the agents who secured the business. Moreover, this direct expense represents but a small part of the cost of the agency system. While the companies themselves are by no means entirely free from blame for the recklessness with which at times rates are cut and risks accepted, it is the uncontrollable zeal of the local agents for business and resulting commissions which usually inaugurates such a movement. The result of the movement is the acceptance of undesirable risks, or of desirable risks at too low a rate, a consequent diminution in the ratio of premiums to insurance written, and, when the effect of the poorer risks has made itself felt, an increase in the proportion of fire losses to insurance written, and finally the failure of weak companies and the depletion of the surplus of strong companies. The situation at length becomes intolerable, compelling a movement to restore rates to a paying basis, and general and special agents for a time exercise great care in their supervision of local agents. The effect of the bad risks accepted during the period of rate-cutting disappears after a year or two, and a period of prosperity follows, which lasts until the cycle starts anew. While local agents have done much good in extending insurance among people who would never have resorted to it unsolicited, and while it is difficult to conceive of any other system on which the business of a large company can be well carried on, still it must be acknowledged that the multiplicity of agents, the magnitude of their tax upon the insured, and the wide divergence between the interests of the agent on the one hand and those of the insurer and insured on the other, are very serious evils necessarily involved in the agency system.

Associations of Underwriters. The tendency to association on which the business of insurance is based is manifested in the formation of all sorts of unions and associations among those engaged in it. In the department of fire insurance these associations are especially numerous, and have attracted much attention through the obvious attempts of some of them to replace competition by mutual agreement as a regulator of rates. There are in the United States more than thirty general associations of fire underwriters, some of them extending over many States, besides a considerable number of local associations, each confined to a particular city. Many of the forms of activity of these associations are universally recognized as legitimate. As examples of such activities may be mentioned the offering of rewards for the apprehension of incendiaries, the inspection of fire departments and water-works, and the organization and support of fire patrols.

Anti-Compact Laws. It is the attempt of the underwriters' associations to regulate rates and thus restrict competition which has attracted the most attention. The popular feeling has undoubtedly been that the rate agreements entered into by nominally competing companies through underwriters' associations have resulted in keeping premium rates illegitimately high. The discussion of the question how far competition affords a desirable regulator of rates in the insurance business belongs in the treatment of the general subject of insurance. It is of immediate interest at this point to notice the legislation against rate agreements which several States have enacted in recent years. Such laws are known as anti-compact laws. The earliest one was passed in Ohio in 1885. This law prohibits not only agreements as to the rates to be charged for insuring against loss by fire, but even agreements as to the commissions to be paid to agents for securing business. Similar laws, so far as the control of rates is concerned, are now in force in ten States besides Ohio—viz. Alabama, Georgia, Iowa, Louisiana, Michigan, Nebraska (declared unconstitutional by the United States District Court, but in force pending an appeal), New Hampshire, South Carolina, Washington, and Wisconsin. In four other States—viz. Arkansas, Kansas, Missouri, and Texas—such combinations are specifically included among those prohibited by general anti-trust laws. The anti-compact movement apparently reached its height in the years 1897-99, no fewer than eight of the fifteen laws in force having been passed during that time. In 1900 only one such law was passed, and none in 1901. In 1902 Virginia repealed the law which she had enacted in 1899. It is coming to be recognized that the attempt to prevent rate compacts by prohibitory legislation cannot succeed, owing to the ease with which secret agreements can be entered into, and it is coming to be suspected that the condition of reckless underwriting which prevails when compacts are actually abolished may be a worse evil than the relatively high rates maintained by means of the agreements.

Relation of Insurance to Amount of Loss by Fire. Increase in Number of Fires Owing to Insurance. The relation of insurance to the amount of fire loss deserves careful consideration. Over against the great gain which the system of fire insurance confers upon society must be set a direct loss due to the increase in the amount of property destroyed by fire as a result of the insurance itself. A part of this increased loss is due to the greater carelessness of the owners because of the insurance; a larger part is due to the deliberate destruction of insured property by the owners for the sake of securing the insurance. What proportion of fires is due to incendiarism it is impossible to determine with accuracy. Various estimates, ranging from 20 to 40 per cent., have been made by different investigators. If fires of unknown origin are largely counted as incendiary, as there is a natural tendency to count them, the proportion is made unduly high. In Massachusetts, for a period of seven years just preceding the first appointment of a State fire marshal, which occurred in 1894, incendiary fires and those of unknown origin combined constituted 33½ per cent. of the total number of fires. The proportion in most States is undoubtedly higher. It must be borne in mind, however, that by no means all incendiary fires are set for the purpose of obtaining insurance. In Massachusetts, for example, in the four years for which statistics are available—viz. 1896, 1897, 1900, and 1901—out of a total of 1264 incendiary fires, only 408, or 32 per cent., were set for the insurance. During the same years incendiary fires constituted 7.1 per cent. of the total number of fires in the State. The percentage is undoubtedly higher in other States. The value of the property deliberately destroyed in order to obtain insurance constitutes one element in the cost of insurance. The insurance companies themselves are indirectly responsible for a part of this loss. It is a matter of common knowledge that agents and brokers show too great laxity in granting insurance on property up to, and sometimes far beyond, its full value. Every instance of over-insurance is a standing invitation to incendiarism. The extent of it is one of the unfortunate results of the zeal of local agents for business and commissions.

Preventive Activity of Insurance Companies. While a part of the annual loss by fire must be charged against the system of insurance, insurance companies must, on the other hand, be credited with a large share of the responsibility for the discovery and application of methods for preventing such loss. Not only have they always been active both in the adoption of preventive measures and in compelling or inducing the insured to adopt such measures, but it is also to their initiative that a large part of the progress in State and municipal activity along the same lines has been due. As an example of direct preventive activity by fire-insurance companies themselves may be mentioned the maintenance of fire brigades and fire patrols. The early English companies laid great stress on the value of their services in extinguishing fires. Companies of 'watermen,' organized for this purpose, were supported, at first by the individual companies, and later by associations among the underwriters. It was not until 1866 that the maintenance and control of the London fire brigades passed from the hands of the underwriters to the municipalities. The English companies still support 'salvage corps,' whose duty it is to protect property from damage by fire or by the water used in extinguishing fires. Insurance companies in the United States have established organizations with duties similar to those of the English salvage corps. They are variously known as fire patrols, salvage corps, and protective associations. The earliest American association of that order was established in New York in 1839. Similar organizations are supported to-day by underwriters' associations in at least thirty of the larger American cities.

Of more importance than this direct preventive activity of insurance companies is the indirect influence which they exert through the pressure which they bring to bear on the insured. This pressure is exerted in some cases through the refusal of the company to accept the risk unless certain changes are made in the property which will lessen the danger of fire; more commonly through inserting in the policy that certain specified acts of the insured, of such a nature as to increase the risk, shall render the policy void, and almost universally by varying the premium rate in accordance with the number of preventive devices adopted by the insured. The introduction of automatic sprinklers into general use was directly due to such discrimination by insurance companies.

Fire Marshals. Finally, it is largely due to the agitation carried on by insurance companies that States and municipalities have adopted various measures for the purpose of preventing loss by fire. The more common forms of public action for this purpose are the maintenance of fire-extinguishing organizations, and the adoption of regulations concerning the storage of explosives and other dangerous commodities, and regulations as to the character of material to be used in the construction of buildings. A more recent movement in the same direction is the adoption of laws for the appointment of State fire marshals. Local fire marshals or other similar officers have long been maintained in the larger cities. The first State fire marshals were authorized by Massachusetts and Maryland in 1894. Three other States have followed their example—Ohio (1900), Connecticut (1901), and Washington (1901). In 1902 Massachusetts transferred the duties of the fire marshal to the district police. In Mississippi the insurance commissioner acts as fire marshal. Along with the establishment of the office of fire marshal has gone the adoption of laws requiring investigation into the origin of fires. Maine and Pennsylvania, as well as the States mentioned above, require such official investigation. Much light will undoubtedly be thrown upon the causes of fires by these investigations, and more intelligent action will be possible for the purpose of diminishing their number and destructiveness.

The duty of State and municipality to adopt regulations for the purpose of minimizing fire losses is too obvious to need discussion. When the carelessness or misconduct of one individual may result in irreparable losses to others who have themselves taken all due precautions, the State is clearly justified in doing all in its power to ward off the danger. What municipalities have done is but a small part of what they might properly do, and what they may be expected to do as more enlightened views of their responsibility in the matter come to prevail.

Technique. The Risk. The proper business of insurance companies is not the prevention of loss by fire, but the assumption of risk. Through an insurance policy the risk to which the property of the insured is exposed is assumed by the insuring company. Insurance in itself may have no effect on the amount of property destroyed by fire, or upon the chance of destruction to which a particular piece of property is exposed. The gain conferred by insurance upon society arises partly from the reduction in the uncertainty as to how much loss will be suffered in a given period through the accumulation of a large number of risks, and partly from a distribution of the losses actually suffered among a large number of individuals. The risk which an insurance company assumes when it insures a piece of property against loss by fire depends upon several factors; viz. the value of the property insured, the probability of fire within a given time, the probable destructiveness of the fire if it occurs, and the length of time for which the insurance is granted. The first and last of these factors are determined with comparative ease and accuracy. The determination of the second and third, on the other hand, presents very great difficulty. So far as human intelligence is concerned, it is largely a matter of chance whether a particular building is visited by fire in a given year or not. The adoption of preventive measures may reduce the probability, but some degree of uncertainty will always remain. And when there is added to that uncertainty the uncertainty as to the extent of the loss occasioned by the fire, it will be seen that there is a large element of chance in the liability which the company assumes so far as any particular property is concerned. Moreover, the uncertainty is of such a nature that the chance of loss cannot be determined by the most careful examination of the property. The knowledge of the conditions affecting the possibility of fire is too imperfect to admit of such direct determination. It is necessary, therefore, to rely upon the statistics of past experience to show what chance of loss a particular risk brings upon the company. If statistics show that each year for a number of years fire has destroyed, upon the average, one out of every thousand buildings of a certain kind, there is one chance in a thousand that any particular building of the same character will be destroyed during the following year. The greater the number of cases from which the average is calculated, the more reliable is the average—that is, the less danger is there that it has been unduly affected by temporary fluctuations in the number of fires. The experience of insurance companies themselves furnishes the most valuable data obtainable for calculating average losses. It is extremely desirable that the movement already under way to combine the experience of many companies, and thus calculate combined experience tables for fire insurance, as they have already been calculated for life insurance, should be carried out.

But even with the help of experience, the problem of calculating the risk incurred by insuring a particular building is by no means simple. In the first place, the probable destructiveness of the fire must be determined from experience, as well as the probability of the occurrence of the fire. In the second place, the problem is made more complex from the fact that no two pieces of property present precisely the same fire features, if the term may be used. To group them in classes at all it is necessary to overlook many minor points which may still have some influence on the degree of risk. Even when this is done, the necessary number of classes is very great. The Home Insurance Company, which has kept a careful record of its fire experience during an existence of nearly fifty years, has found it necessary to make more than 150 classes of risks. The process of arranging risks in groups according to the chance of loss to which they are exposed is known as the classification of risks. It is a matter of great importance that this classification should be as accurate as possible. It is of importance to the companies, because a general underestimating of risks must result in loss to them; it is of importance to the insured, because imperfect classification means an unjust distribution of the burden of insurance. If any kind of property is put in a more hazardous class than it properly belongs in, the owners of that property contribute more than their share to the cost of insurance. Farmers, as a class, for example, believe that farm property is thus unjustly classified by the large insurance companies, and that rates on such property are higher than they should be. It is that belief which is partly responsible for the spread of small mutual companies among them. The fire experience of these mutual companies lends some support to this claim.

THE POLICY. The terms of the insurance contract are set forth in the policy. In the early days of fire underwriting there was great diversity in the forms of policies, and considerable uncertainty in consequence as to their provisions. Underwriters' associations began early to urge the adoption of a common form of policy for fire insurance, and more recently the legislatures of the various States have taken the matter under consideration. Fifteen States now have laws describing the form of policy to be used in writing fire insurance within their borders. Massachusetts adopted a standard form in 1873, New Hampshire in 1885, New York in 1886. The other twelve States have since adopted the New York form, sometimes with minor variations. Moreover, the large companies have introduced the New York standard policy into many States where its use is not compulsory, so that a uniform policy is now written by them in nearly all parts of the United States. This policy contains, among other things, very clear and precise statements as to the limitation of the liability of the insurer, as to acts of the insured which will cause the policy to become void, and as to the necessary procedure by the insured in proving a claim to indemnity in case of loss. To give some degree of flexibility to the policy, a series of riders has been prepared, which the companies are in many States authorized to attach to the policy, and which thus become a part of the contract.

TERMINATION OF THE POLICY. A fire-insurance contract may be terminated in any one of four ways. It may be made void by the failure of the insured to live up to the conditions contained in the policy; the time for which the insurance is granted may expire, when all liability of the insurer ceases; the policy may be canceled at the request of either insurer or insured; or, finally, the insured property may be destroyed by fire and the payment of the indemnity by the insurer to the insured terminate the contractual relations between them. The first three methods are simple, and need no comment. Trouble arises only in the settlement of claims for indemnity. Not to speak of the somewhat elaborate formalities to be observed by the insured in proving the amount of loss he has suffered, disputes often arise as to the amount of the liability of the company. In States where there is no legal regulation prohibiting such an arrangement, the policy usually provides that the liability of the company shall be limited to the actual value of the property destroyed. Even in case of total loss the insurer cannot recover the total amount named in the face of his policy unless he can prove that his property at the time of the fire was worth that amount.

VALUED-POLICY LAWS. Partly on account of the injustice involved in collecting premiums on a larger amount of insurance than the company is ready to pay even for a total loss, and partly because of the tendency to laxness in appraising property for insurance under this system, several States have passed so-called 'valued-policy' laws. These laws do not apply to movable property, for reasons easily discerned. In the case of fixed or immovable property, valued-policy laws provide that, in the absence of fraud on the part of the insured, the company must pay the full amount of the face of the policy in case of total loss. In some States, however, allowance may be made for depreciation in the value of the property between the time of insurance and the time of loss; while in others allowance is made for any change in the property during that time of such a character as to increase the risk. Wisconsin was the first State to pass a valued-policy law, which it did in 1874. Nineteen other States and Territories have since passed similar laws. Several other legislatures have also passed them, only to have them vetoed by the governors. Of the eight bills passed during the years 1899-1901, no less than five were vetoed. Insurance companies have opposed the passage of such laws, and resisted them when passed, so far as possible. In the case of the Missouri law, they went to the United States Supreme Court on the question of its constitutionality. The court declared it constitutional. In the absence of legislation, when the same property is insured in several companies, the insured can recover only the actual value of the property destroyed. The various companies pay such a part of the indemnity as the insurance they are carrying constitutes of the total amount of insurance on the property. In most States having valued-policy laws, however, the amount of insurance stated in the face of each policy must be paid in the case of total loss of immovable property.

SURPLUS INSURANCE. A special form of insurance known as surplus insurance is sometimes written. This is sold under the condition that the company granting it does not become liable for indemnity in case of fire, unless the loss of property is so great that the entire amount of regular insurance fails to cover it. Such surplus insurance is furnished at rates below those charged for regular insurance, since in most cases of partial loss the regular insurance is enough to cover the loss, and the company furnishing surplus insurance escapes liability.

COINSURANCE. A large proportion of fires result in only partial losses to insured property. In the absence of any stipulation to the contrary, a partial loss must be paid in full, provided it does not exceed the amount of the insurance. There are two unfortunate results of this arrangement. One is that it increases the complexity of the calculation which an insurance company must make in estimating the risks it assumes. The other is that in the long run persons insuring their property for a small part of its value gain at the expense of those carrying insurance more nearly equal to the value of their property. If, for example, of two similar pieces of property each worth $10,000, one is insured for $4000 and the other for $8000, the premium paid by the owner of the former property is only one-half of that paid by the owner of the latter. If now each piece is damaged by fire to the extent of $3000, each owner recovers the full amount of the loss. The ratio of premium to indemnity is therefore twice as great in the one case as in the other. There are two possible remedies: The premium rate might be lowered as the ratio of insurance to value was increased, since the actual risk for $1000 insurance diminishes *pari passu.* A very different remedy is usually adopted, however, known as coinsurance. A coinsurance clause attached to a fire policy stipulates that the owner of insured property must insure for a certain percentage—usually 80 per cent.—of its value; or, if he carries less insurance, must be held to be his own insurer for the difference between the amount carried and the 80 per cent. This provision has no effect upon the amount of the indemnity received in the case of total loss. In the case of partial loss, however, it does away with the discrimination in rates in favor of small insurance. To recur to the example already used, the two pieces of property, each worth $10,000, must, in accordance with the coinsurance clause, be insured for $8000. The owner who has only $4000 of insurance is considered to carry his own insurance for the other $4000. If the two pieces of property were totally destroyed, each owner would receive as indemnity the amount stated in the face of the policy, and the ratio of premium to indemnity would be the same in the two cases. If, on the other hand, each piece of property was damaged to the extent of $3000, the owner carrying only $4000 of insurance would receive but $1500 of indemnity, since as self-insurer for one-half of the required 80 per cent., he must bear one-half the loss. The other owner, having insured his property for the full 80 per cent., would receive the full $3000 from the insurance company. In this way the ratio of premium to indemnity is made uniform in the two cases. The principle of coinsurance is that the entire property at risk should bear the burden of the loss of any part of it. It is a principle long familiar in marine insurance under the name of 'average.' It is applied to all fire-insurance policies issued in France, Germany, Belgium, and Russia. It is clearly in the interests of justice, since it brings about a more equitable distribution of the cost of insurance.

Anti-Coinsurance Legislation. In spite of all these facts, the attempt to introduce such a clause into fire-insurance policies in the United States has met with great opposition. It was first used to any extent in 1892, and as early as 1893 three States passed laws prohibiting its use. These States were Missouri, Tennessee, and Maine. (Maine repealed the law in 1895.) Similar laws have since been enacted by nine other States, in the following order: Louisiana, Iowa, Georgia, Indiana, Michigan, Minnesota, Wisconsin, Ohio, and New Jersey. The Ohio law, which was passed in 1896, was repealed in 1902, leaving ten States with such laws still in force. To break down the opposition to the coinsurance clause, the companies have adopted a plan of offering insurance at a lower rate when the coinsurance clause is in the policy than when it is not. This they can afford to do, since the effect of the clause is to reduce the risk. Several States which prohibit coinsurance clauses under other circumstances, authorize them when they are accompanied by a reduction of rates.

Governmental Regulations. The discussion of the advisability of Government ownership and management of the insurance business belongs in the general article on Insurance. So far as fire insurance is concerned, there have been but few experiments in that direction. Such Government fire-insurance offices as have been established, chiefly in Prussia and Switzerland, have operated over so small a territory that their experience is of little value. They have lacked one of the chief supports of an insurance office—the increased regularity in the proportion of losses to risks which results from bringing many risks together in one company. In all parts of the civilized world governmental supervision and regulation of private companies is the general rule in the insurance business. In the United States each individual State exercises supreme authority over the business within its own territory, as the National Government has as yet made no attempt to regulate it. The result is a great deal of diversity in the laws to which companies operating in a large number of States are subjected. Nearly all these laws have been passed in the real or supposed interests of the insured. A few relating to taxation have been passed for the purpose of raising revenue. Reference has already been made to certain special laws in force in a comparatively small number of States; viz. anti-compact laws, valued-policy laws, and anti-coinsurance laws. It remains to notice a few of the more common provisions of the different States. In nearly all States it is necessary for a company desiring to do business within its borders to secure a license from the proper State official. In some States it is necessary for a company from without the State to make a deposit for the security of policy-holders within the State. It is sometimes necessary for agents to secure licenses to solicit business within the State. In nearly all States companies are required to make annual reports, and to submit to examination by the proper State official whenever he deems it necessary. In most States they are required to maintain a reserve sufficient to reinsure all outstanding risks. All States tax fire-insurance companies (certain mutual companies are exempted in some States), and sometimes a discrimination in taxation is made in favor of domestic companies against those from outside the State. In many States a 'reciprocal' law is in force with regard to taxation and the conditions of entering the State—that is, the law of the State provides that a company from any other State, desiring to enter its borders, must meet the same requirements as the State in which the company is chartered imposes upon other State companies. The great diversity of the regulations adopted by the different States points conclusively to the desirability of national control of the insurance business through Congressional legislation.

FIRE ISLAND, or Great South Beach. A low spit of sand, about 50 miles long but broken by inlets, almost 40 miles southeast of New York City (Map: New York, G 5). It separates the Great South Bay from the Atlantic Ocean. On its western end is a lighthouse of the first order; also a station from which transatlantic steamers bound for New York are first sighted. The beach is a popular summer resort. Margaret Fuller Ossoli, with her husband and child, perished by shipwreck on Fire Island in 1850.

FIRELESS ENGINE. A form of steam or vapor engine which is detached from the heating apparatus. Dr. Emile Lamm, of New Orleans, invented July 19, 1870, an engine in which the motive power was derived from the vapor of ammonia. The ammonia, as it escaped from the engine, was passed into a reservoir of water, in which it was absorbed; the water when heated to a temperature of about 135° F. gave up the ammonia as gas, which was returned to the engine to be used over again, and then again absorbed and returned as before. This engine was found efficient and economical for the movement of street cars. The use of ammonia was soon abandoned, steam taking its place. Water heated to 212° F. becomes vapor if the pressure upon it be no more than the usual atmospheric 15 pounds per square inch. If the pressure be greater, the water remains liquid until a higher temperature is reached, the temperature varying with the pressure according to well-known laws. If steam at a high pressure be admitted to water of low temperature and pressure in a closed vessel, the steam will be condensed in the water, but the pressure in the vessel will be increased, while the volume of the water will be enlarged by the volume of that derived from the condensed steam. The water thus becomes charged with steam condensed under high pressure, and when the pressure is relieved, a portion of the steam reverts to its condition of vapor, and may be conducted in the usual way to a cylinder and piston, where it will do its customary work. The opening of the valves gives vent to the vapor, gradually reduces the pressure, and relieves the condensed steam; so that a tank, filled with water and stored with many times its volume of uncondensed steam, will furnish motive power sufficient to move the engine and a considerable train of cars for a trip of several miles. On its return, the tank is connected with a stationary boiler from which it receives a fresh supply of steam. It will not be forgotten that the real force of the steam is due to the heat which it contains, and that if the heat be lost, by radiation or otherwise, from the tank containing the condensed steam, its potential energy is so much reduced. In the engine used at New Orleans the mechanism was that of an ordinary locomotive minus its fire-box, having a water-tank instead of a boiler; the appliances for stopping, starting, and backing were as usual. The tank was about 6 feet long, and 3 feet in diameter, covered thickly with felt and wood to retain its heat. Steam was taken until the gauge indicated 135 to 150 pounds, the temperature for 135 pounds being 353°. With this accumulation of power the machine ran 5 to 7 miles before the pressure was reduced to 60 pounds. The labor and care of firing is avoided on one of these engines.

FIRELOCK. A firearm introduced about 1690, the charge of which was ignited by the concussion of flint and steel. The *matchlock* previously in use required a lighted match at the powder-pan. See Small Arms.

FIRENZUOLA, fē'rĕn-zo͞o-ô'lä, Agnolo or Angiolo Giovannini (1493-c.1548). An Italian writer, remembered chiefly for the idiomatic elegance of his language and for his spirited translation of *The Golden Ass* of Apuleius. From the scanty details contained in his own writings it is known that he was born at Florence, studied law at Siena and Perugia, and afterwards went to Rome, where he enjoyed the favor of Clement VII. It seems well authenticated that he finally joined the Brotherhood of Vallombrosa, and rose to considerable influence; but after the death of Clement VII. he returned to Tuscany and lived the remainder of his life at Prato. Firenzuola's works, nearly all of which were first published several years after his death, include two comedies, a dialogue, *Delle bellezze delle donne,* a eulogy upon the charms of women; *Discorsi degli animali,* the basis of which was probably a Latin version of the Sanskrit book of fables known as the *Panchatantra* (q.v.); and the *Ragionamenti,* a collection of *novelle* written in imitation of the *Decameron.* For biographical notices, consult: Bianchi's edition of Firenzuola's works (Florence, 1848); and that of Guerrini, *Novelle di Firenzuola* (Florence, 1886).

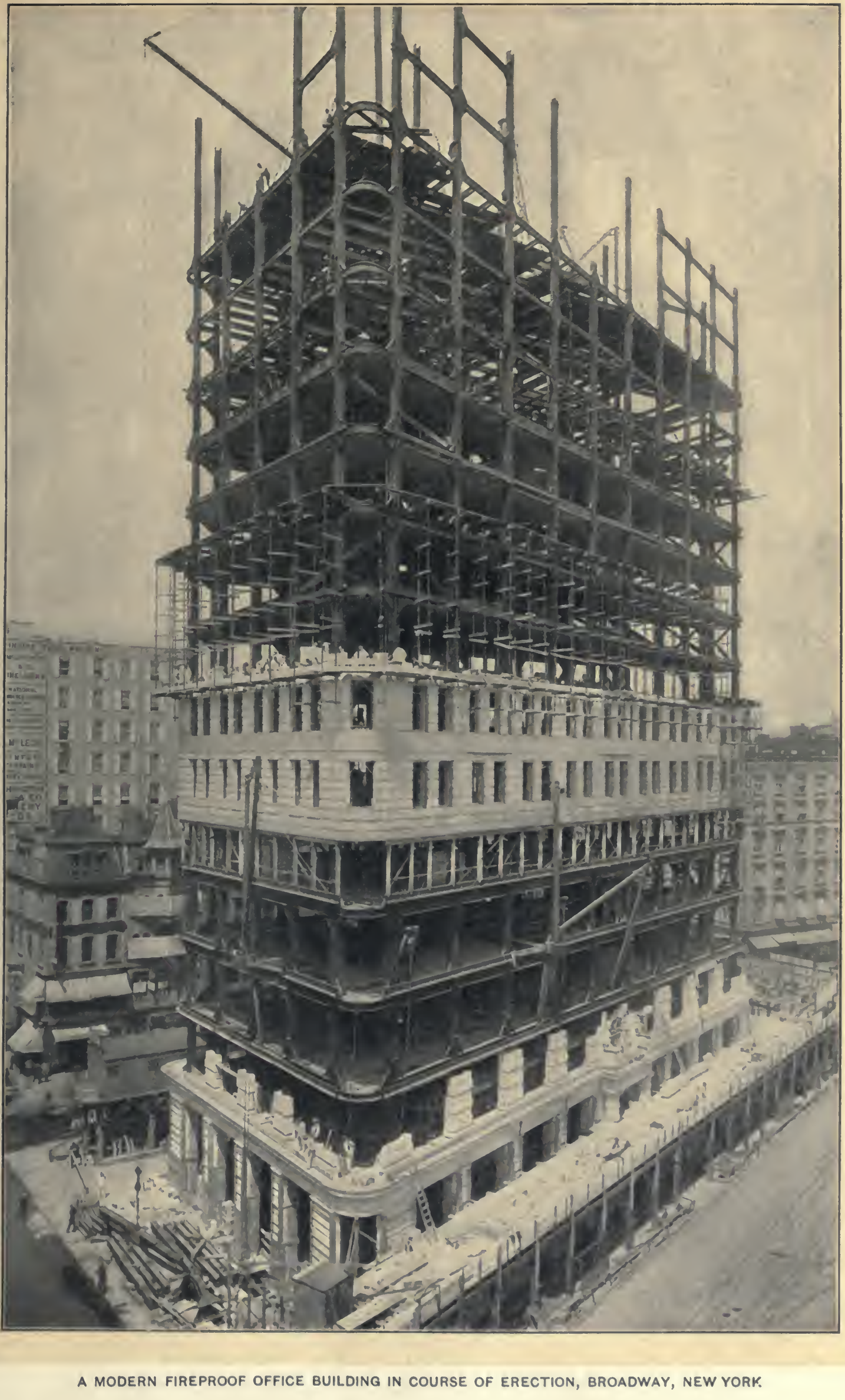
FIRE-PINK. See Silene.

FIREPLACE. See Heating and Ventilation.

FIREPROOF BUILDING. See Fireproof Construction.

FIREPROOF CONSTRUCTION. The systematic study of fireproof or fire-resisting building construction is a development of comparatively recent years. In 1900 fireproof construction was confined practically to buildings of public or semi-public nature and to factories, stores, warehouses, and office buildings, and only the larger and more expensive of these structures were built with careful attention to the fire-resisting qualities of their construction. The extension of fireproof construction to include all buildings is a development of the future. The earliest buildings having anything approaching a fireproof construction were those used for public purposes, in the building of which the architects were less hampered by considerations of economy in money and space than was necessarily the case in purely commercial structures. In these buildings the walls were made of sufficient thickness and stability to allow the use of vaulted floor construction, for which brick arches were generally used, giving rise to much extravagance in space and dead weight. Partitions were generally brick walls and the stairways were of stone or iron. The entire construction was thus massive and heavy, and was, therefore, limited to buildings of small height and considerable area.

Modern fireproof construction began virtually with the use of iron in building construction. At first attention was confined chiefly to the



A MODERN FIREPROOF OFFICE BUILDING IN COURSE OF ERECTION, BROADWAY, NEW YORK

development of fireproof floor systems. Perhaps the first known example of iron and masonry fireproof floor construction was the cotton-mill of Phillips & Lee, of Manchester, England, erected in 1801. In this mill cast-iron floor-beams were spaced ten feet apart and brick arches were sprung between them. This construction, like the vaulted floor construction previously mentioned, was very heavy, and no great progress could be expected in its extension to commercial and business buildings. In 1853 the rolled I-beam of wrought iron began to be made in Europe, and a year later its manufacture was begun in America. In 1885 steel I-beams began to be rolled in America. With the rolled I-beam it became possible to develop an I-beam and brick-arch floor system, in which the arches were reduced to such small space that a single thickness of bricks would make an arch of sufficient strength. This brought the weight of the floor down to 75 pounds per square foot, which was a decided improvement over the cast-iron floor-beam and brick-arch construction. The next attempt to improve upon fireproof floor construction was to spring curved sheets of corrugated iron between I-beams and fill above them with concrete. This construction did not result in any material reduction in the weight of the floor, and it was further objectionable in that the arches themselves were not fireproof. Until 1870 the system of fireproof construction consisted of solid masonry walls inclosing a framework consisting of cast-iron columns carrying a system of rolled-iron floor-beams between which were sprung brick arches or arches of corrugated iron and concrete. The columns were left bare, as were the bottom flanges of the floor-braces. To-day this is recognized as a faulty construction, but in the early days of the art of fireproofing iron, being incombustible, was also regarded as fireproof.

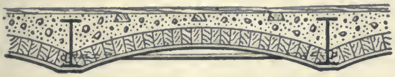


FIG. 1. BRICK-ARCH FLOOR.

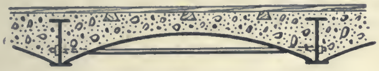


FIG. 2. CORRUGATED IRON AND CONCRETE ARCH.

The next development in the construction of fireproof floor systems was the invention of the hollow tile, 'flat' arch, which was first applied in the Kendall Building in Chicago in 1872. About the same time a similar but heavier construction was used in the New York Post-Office. For the next ten years the development in tile arches consisted of attempts to design a lighter construction and at the same time to obtain a stronger construction. Until about 1883 all tile arches projected about one-half inch below the bottoms of the floor-braces, and the incased spaces thus left under the beam flanges were filled with plaster. All tiles were also made without interior webs.

In 1883, in building the Mutual Life Insurance Building in New York, a 9-inch flat-tile arch was used throughout, where each tile had one vertical and one horizontal web, and a special flat tile was used instead of the former plaster filling, to protect the bottom flanges of the I-beams. With these innovations the flat-tile arch entered upon its final stage of development. About 1880 attention was turned to the design of column protection, but it was not until 1886 that such protection was generally specified. Next to the hollow tile, the most commonly used materials for fireproofing are concrete and plaster compositions. The use of concrete for fireproof floors very probably antedates the tile arch, but its active development as a fireproof material has been virtually confined to the last decade. Its sudden development was largely due to the invention and perfection of concrete steel construction. Modern concrete fireproof floors consist of concrete arches, either flat or curved, containing an imbedded network of steel. Plates of concrete when subjected to bending loads are deficient in tensile strength, and the purpose of the imbedded network is to supply this deficiency. Plaster composition floors are also usually constructed with imbedded metal network.

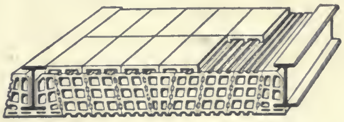


FIG. 3. CLAY TILE SIDE CONSTRUCTION.

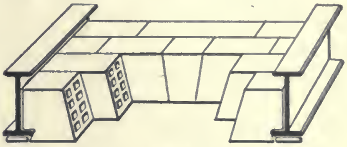


FIG. 4. CLAY TILE END CONSTRUCTION.

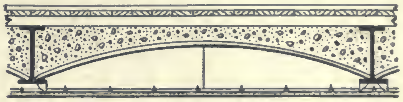


FIG. 5. ROEBLING CONCRETE STEEL FLOOR.

In 1883 the modern era of tall skeleton building construction began in Chicago, and thence spread throughout the United States. The absolute necessity of making these enormous structures fireproof has been one of the strongest influences in developing the present system of fireproof construction. The modern steel skeleton building consists of a steel framework or skeleton covered with a skin and integument of masonry and fireproofing. All of this integument is supported by the steelwork except that sometimes the exterior walls are made self-supporting. Foundation construction for tall buildings is described in the article on FOUNDATIONS. The steel skeleton consists of a series of steel columns rising from the foundations and surmounted by the roof framework. At each floor the columns are braced together in a horizon-

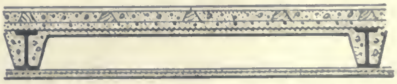


FIG. 6. EXPANDED METAL CONCRETE STEEL FLOOR.

tal plane by the girders and braces of the floor-framing. Where wind-pressures are to be feared, certain of the columns are braced together in a vertical plane by wind-bracing. The steel skeleton of a tall building is structurally independent of the walls, flooring, partitions, and roofing. As it stands, it is incombustible, but not fireproof, since a sufficiently hot fire will cause the steel to expand, twist, buckle, and be otherwise distorted to the extent of practical destruction. The purpose of the fireproof integument is to protect the steel from heat in case of fire, by covering it or imbedding it in a material which is indestructible by fire and a poor conductor of heat. The fireproofing of a steel skeleton building comprises, therefore, the following principal items: Fireproof floor construction; column protection; fireproof partitions; roof and ceiling protection; and exterior wall construction. Keeping in mind that, so far as the matter of fireproofing is concerned, the object of each of these items is to keep fire and heat away from the steelwork and prevent the rapid approach of flames, attention may be turned to the general details of fireproof construction as it is practiced in modern tall buildings. Only general methods can be described here; for details, one of the special treatises mentioned at the end of this article should be consulted.

As stated above, the framework of the floors consists of a system of girders and floor-beams supported by the columns; the girders carry the floor-beams, which are spaced about five feet apart. To fill the spaces between these beams and girders and to protect them from fire, arches of hollow tile, concrete, or other fireproof materials are built. These arches are made in a variety of forms, but in all forms the purpose is first to span the opening between the floor-beams with a fireproof material which is strong enough to carry the floor-loads; which will not suffer structural injury from fire; and which is so designed that when the floor is completed every portion of the steel framework is covered by the fireproof material and thus protected from the direct action of the fire. Next to the floor-framing, the most important part of the steel skeleton requiring protection is the columns. The variety of forms of columnar protection is almost as great as the variety of forms of floor systems. With all forms, however, the object is to inclose the column in a casing of fireproof material which is thick enough to prevent the access of destructive heat to the steel.

Roof protection usually consists in constructing a fireproof ceiling below the roof-framing, which cannot be penetrated by fire, and to make the upper extension of the side-walls and the roof-covering similarly proof against the passage of fire; the steelwork is thus inclosed in a box or shell impermeable to fire. Another method less commonly employed is to incase each member of the roof-framing in fireproof material. Partition construction varies with the kind and form of material used. Tiles or plaster-block partition fireproofing are usually laid up with mortar exactly like a brick wall; metal or plaster or concrete partitions consist of a metal or timber studding carrying metal laths on each side which is covered with plaster. The chief object of making partitions fireproof is to confine the fire to the room in which it originates, or at least to retard its spread from room to room. The floors are supposed to retard its spread from one story to another. Floors and partitions must, however, have doors, stairway openings, elevator shafts, etc., to permit communication from room to room and from floor to floor. This has led to considerable search for some practicable means of closing such openings, but so far none has been devised which meets with sufficient favor to have been generally adopted. So far as fireproofing is concerned, the exterior walls have the duty to perform of protecting the exterior columns and preventing the access to the building of flames from the outside. Exterior walls are usually built of stone, brick, or terra-cotta, or a combination of these materials. They must necessarily have windows and doors, and these are their weak points as regards protection against the penetration of flame from the outside. To remedy this weakness, various forms of fireproof door and shutter construction have been developed.

Besides the structural features which have been described, modern fireproof building construction comprises, as an essential, equipment for the fighting of fire. Such buildings are nearly always provided with lines of standpipes rising from the street to the roof and provided with hose connections and lines of hose on each floor. These standpipes are so arranged that they can be connected either with the pumps belonging to the building or with fire-engines located in the street. The last few years have furnished several examples of fires in fireproof buildings. These fires have, on the whole, established the value of such construction, although they have also shown that many weak points exist in modern methods of fireproofing.

At the present time the building regulations of all large cities recognize fireproof construction of buildings, and prescribe the methods in which it shall be carried out and the material which shall be used. The building code of New York City, adopted in 1899, contains probably the most comprehensive set of regulations governing fire protection and fireproof construction yet enacted by any American city. As these requirements illustrate modern American fireproof building practice, they are given nearly in full herewith.

Fire Protection. All buildings exceeding 85 feet in height must have standpipes running from cellar to roof, with siamese connection for fire-engines at the curb level, and hose connections on each floor and on the roof. For buildings between 85 feet and 150 feet high standpipes must be 4 inches in diameter, with 2½-inch hose connections, and for buildings over 150 feet high this standpipe must be 6 inches in diameter. In every such building a steam-pump and at least one passenger elevator must be in readiness for the use of the fire department at all times. Where a building extends from street to street, or is L-shaped, so as to have two street fronts, there must be a standpipe for each front. All buildings more than two stories high and used for business purposes must have fireproof shutters for every exterior window above the first floor. Fire-escapes must be provided and kept in good working order.

Fireproofing. Every building to be used as a hotel, lodging-house, school, theatre, jail, police station, hospital, asylum or institution for the care or treatment of persons, the height of which exceeds 35 feet, and every other building the height of which exceeds 75 feet, except as otherwise provided, must be built fireproof. The stairs and staircase landings must be built entirely of brick, stone, Portland cement, concrete, iron, or steel. No woodwork or other inflammable material shall be used in any of the partitions, furrings, or ceilings in any fireproof buildings, excepting, however, that when the height of the building does not exceed twelve stories, or more than 150 feet, the doors and windows and their frames, the trims, the casings, the interior finish when filled solid at the back with fireproof material, and the floor-boards and sleepers directly thereunder may be of wood, but the space between the sleepers shall be solidly filled with fireproof materials and extend up to the under side of the floor-boards. When the height of a fireproof building exceeds twelve stories, or is more than 150 feet, the floor-surfaces shall be of stone, cement, rock, asphalt, tiling, or similar incombustible material, or the sleepers and floors may be of wood treated by some process approved by the Board of Buildings to render the same fireproof. All outside window frames and sash shall be of metal, or of wood covered with metal. The inside window frames and sash, doors, trim, and other interior finish may be of wood covered with metal, or of wood treated by some process approved by the Board of Buildings to render the same fireproof. All hall partitions or permanent partitions between rooms in fireproof buildings shall be built of fireproof material, and shall not be started on wooden sills or on wooden floor-boards, but be built on the fireproof construction of the floor and extend to the fireproof beams filling above. The tops of all doors and window-openings in such partitions shall be at least 12 inches below the ceiling-line.

Fireproof floors shall be constructed with wrought-iron or steel floor-beams tied together at intervals of not more than eight times the depth of the beam. Between the wrought-iron or steel floor-beams shall be placed brick arches springing from the lower flange of the steel beams; or hollow tile arches of hard-burnt clay or porous terra-cotta of uniform density and hardness of burn; or arches of Portland cement concrete, segmental in form, which shall have a rise of not less than 1¾ inches for each foot of span between the beams; or between the said beams may be placed solid or hollow burnt-clay, stone, brick, or concrete slabs in flat or curved shapes, concrete, or other fireproof composition, and any of said materials may be used in combination with wire cloth, expanded metal, wire strands, or wrought-iron or steel bars; but in any such construction, and as a precedent condition to the same being used, tests shall be made. These tests shall be made by constructing within inclosure walls a platform consisting of four rolled-steel beams, 10 inches deep, weighing each 25 pounds per lineal foot, and placed 4 feet between the centres, and connected by transverse tie-rods, and with a clear span of 14 feet for the two interior beams, and with the two outer beams supported on the side walls throughout their length, and with both a filling between the said beams and fireproof protection of the exposed parts of the beams of the system to be tested, constructed as in actual practice, with the quality of material ordinarily used in that system and the ceiling plastered below, as in a finished job. Such filling between the two interior beams shall be loaded with a distributed load of 150 pounds per square foot of its area, and all carried by such filling; the platform so constructed being subjected to the continuous heat of a wood fire below, averaging not less than 1700° F., for not less than four hours, during which time no flame will have passed through the platform, and no part of the load shall have fallen through, and the beams shall have been protected from the heat to the extent that after applying to the under side of the platform at the end of the heat test a stream of water directed against the bottom and discharged through a 1⅛-inch nozzle under 60 pounds pressure, for five minutes, and after flooding the top of the platform with water under low pressure, and then again applying the stream of water through the nozzle under the 60 pounds pressure to the bottom for five minutes, and after a total load of 600 pounds per square foot uniformly distributed over the middle bay shall have been applied and removed, after the platform shall have been cooled, the maximum deflection of the interior beams shall not exceed 2½ inches. Any system failing to meet the requirements of the test of heat, water, and weight prescribed shall be prohibited from use in any building hereafter erected.

No filling of any kind which may be injured by frost shall be placed between said floor-beams during freezing weather, and if the same is so placed during any winter month, it shall be temporarily covered with suitable material for protection from being frozen. On top of any arch, lintel, or other device which does not extend to and from a horizontal line with the top of the floor-beams, cinder concrete or other suitable fireproof material shall be placed to fill up solidly the space to a level with the top of the floor-beams, and shall be carried to the under side of the wood floor-boards in case such be used. All fireproof floor systems shall be of sufficient strength safely to carry the load to be imposed thereon without straining the material in any case beyond its safe working load. The bottom flanges of all wrought-iron or rolled-steel floor-beams and flat roof-beams, and all exposed portions of such beams below the abutments of the floor-arches, shall be entirely incased with hard-burnt clay, porous terra-cotta, or other fireproof material allowed to be used for the filling between the beams, to which such incasing material shall be properly secured. The exposed sides and bottom plates or flanges of wrought-iron or rolled-steel girders supporting iron or steel floor-beams, or supporting floor-arches or floors, shall be entirely incased in the same manner. After the floors are constructed no opening greater than eight inches square shall be cut through said floors unless properly boxed or framed around with iron. And such openings shall be filled in with fireproof material after the pipes or conduits are in place. All columns, including the lugs and brackets on same, used in the interior of any fireproof building, or used to support any fireproof floor, shall be protected with not less than two inches of fireproof material, securely applied. The extreme outer edge of lugs, brackets, and similar supporting metal may project to within seven-eighths of an inch of the surface of the fireproofing.

BIBLIOGRAPHY. The best literature relating to fireproof building construction is contained in the volumes of the various engineering papers for the last ten years. Among the books which may be consulted with advantage are: Freitag, *The Fireproofing of Steel Buildings* (New York, 1899); Birkmire, *The Planning and Construction of High Office Buildings* (New York, 1898); and Kidder, *Building Construction*, part i., "Masons' Work" (New York, 1896).

FIREPROOFING. The coating or impregnation of combustible materials, such as textile fabrics and wood, with chemical preparations so as to prevent their burning either partially or entirely. Such substances for the most part act by coating the material with a crust of mineral matter on the surface of the fibres that serves to prevent combustion, but does not interfere with decomposition. Cotton or linen may be steeped in any saline solution, such as alum, ammonium chloride, ammonium phosphate, borax, sodium phosphate, and sodium tungstate, in order to render them incombustible. It is said that muslin dipped or washed in a solution containing 20 per cent. of sodium tungstate is perfectly non-inflammable when dried. Preparations of these salts in various combinations and proportions find extensive use for the treatment of canvas used for scenery in theatres, and in many places it is required by law that the drop-curtain shall be fireproof. Papers that are both fireproof and waterproof may be made from a pulp consisting of vegetable fibre to which asbestos and salts, such as alum and borax, in suitable proportions, have been added.

For the fireproofing of timber a number of processes have been invented, and include the impregnation of the wood with such salts as iron sulphate and calcium chloride, sodium silicate, sodium tungstate, zinc chloride, and even common whitewash. A similar result is frequently obtained by means of so-called fireproof paints. These include paints in which sodium silicate and zinc chloride have been incorporated. A preparation consisting of boric acid, sodium borate, soluble cream of tartar, ammonium sulphate, potassium oxalate, and glycerin mixed with glue and incorporated with a paint, has been used in Paris as a fireproofing paint in the theatres. A mixture of these salts may also be used to render fibrous materials fireproof. See FIREPROOF CONSTRUCTION.

FIREPROOF SAFES. See SAFES AND SAFE DEPOSIT VAULTS.

FIRE PROTECTION, MUNICIPAL. The fire-protection service includes not only the fire-alarm telegraph, fire-engines, and water-works (qq.v.), but a variety of apparatus used in fire-fighting, horses to draw the apparatus, and men to operate and direct the whole. The sum total, with the general exception of the water-works system, constitutes the *fire department*. It is hard to say whether the training displayed by the men or by the horses is most to be admired; but the intelligence, skill, quick initiative, courage, and devotion of the firemen are qualities possessed by them alone, and which are often developed to a far higher degree in firemen than in any other branch of the municipal service. After the consideration of water-supply and fire-engines, wherever the pressure afforded by the water-works system is not sufficient for fire purposes, *fire hose* comes next in importance. Rubber-lined hose is essential to the minimum loss of pressure, and is made with an outer cotton fabric which is either knit or woven, or rubber-lined linen may be used. The hose may be single or double jacketed, with some fabric for protection against wear. *Nozzles* or *play pipes* are of metal, tapered from the size of the hose, which should not be ordinarily less than 2½ inches, to the desired size of the stream, which commonly ranges upward from 1⅛ or 1¼ inches. *Relief valves* may be placed on either hydrants or engines, to enable the fireman to shut off the water at the nozzle without danger of bursting the hose or making it difficult to handle.

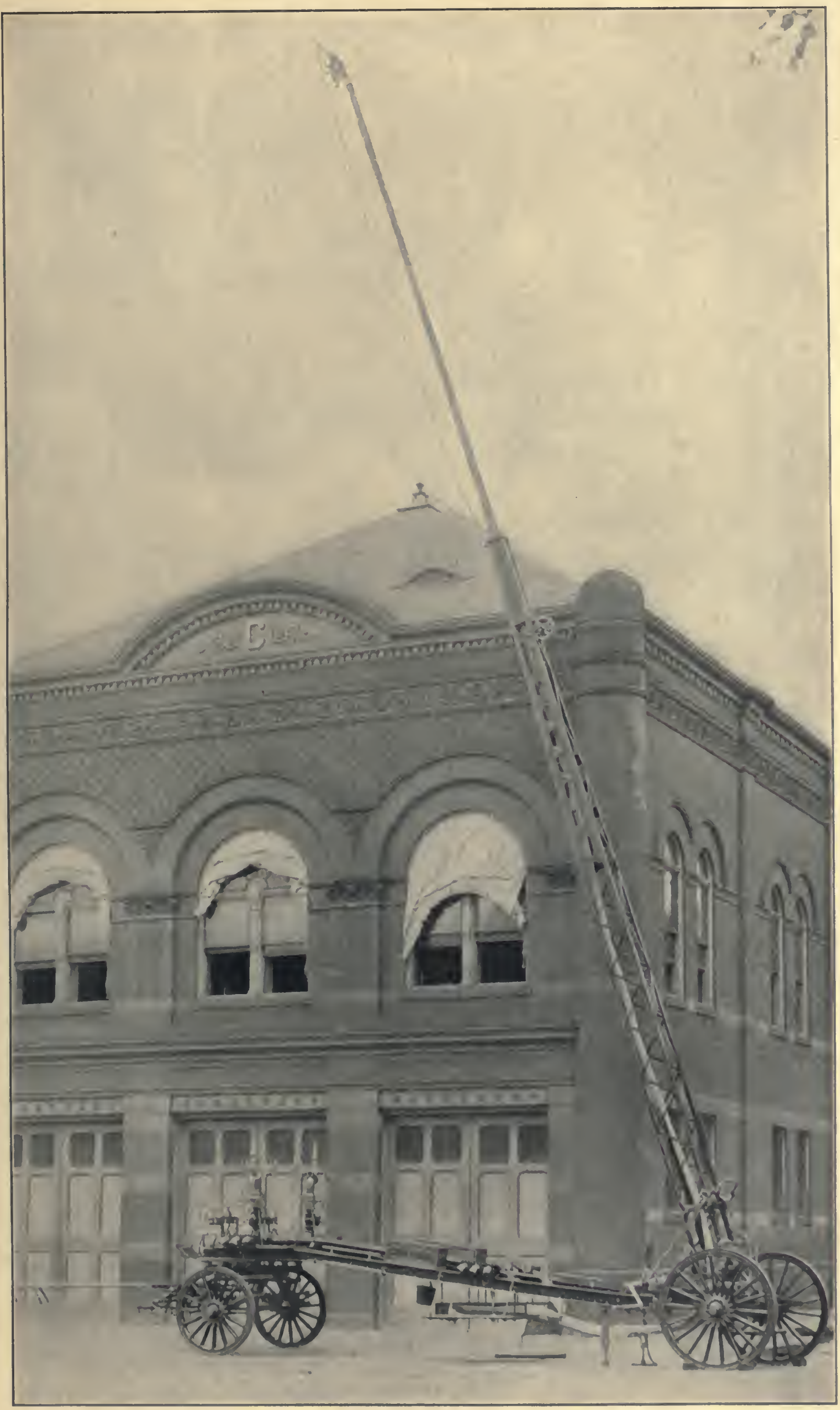
Electric hose signals are used sometimes to enable the fireman at the nozzle of a hose to signal to the man in charge of the fire-engine or hydrant. An insulated electric wire is placed between the lining and outer covering of hose equipped with special couplings. A push button on the nozzle connects with a battery and signal bell on the engine, and by means of a signal code orders are given to turn on or shut off water, saving much time. *Monitor nozzles* are attached to standpipes placed on roofs, fireboats, or elsewhere, and are so arranged that by means of proper joints and wheels for turning the nozzle a stream may be given a horizontal range of 360° and a vertical range of 100° or more. They may be used at the base of a water-tower, or mounted alone on a platform and wheels, and used to turn water into the lower portions or down into the basements of buildings. Once set, a stream may be thrown in a given direction as long as desired, without further attention.

Water-towers are valuable accessories to hose. They are tall, portable standpipes, which may be raised or lowered at will, and are mounted on trucks drawn by horses. A nozzle at the top, more or less like the monitor nozzle, enables the operator to turn a stream in any direction. One or more lines of hose may be coupled to the base of the tower. A material saving in friction loss is made by substituting the vertical pipe for an equal length of hose, on account of the smoother interior surface of the iron.

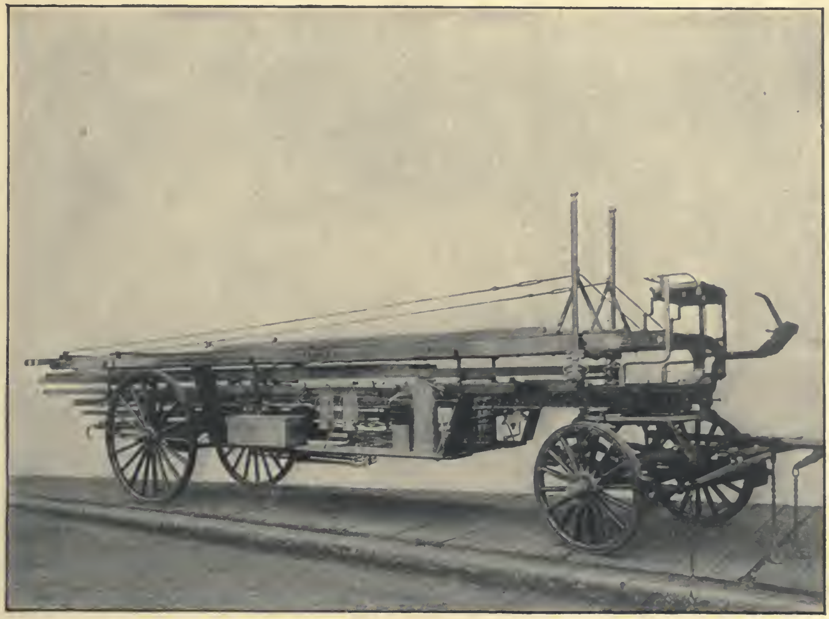
Hose-carts and *hook-and-ladder trucks* are made in a great variety of styles. *Aërial ladders* may be run up quickly by mechanism mounted on the truck. Gas may be generated to aid in raising either ladders or water-towers.

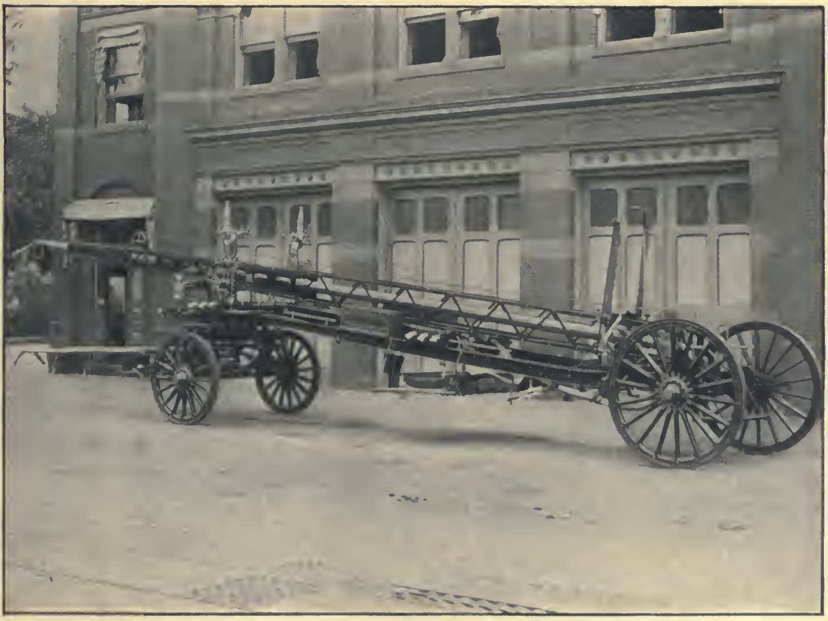
Fire-houses include the various buildings used to shelter fire apparatus, horses, and men, and are known as engine, hose, or hook-and-ladder houses, according to their actual uses. With paid fire departments the men as well as the horses are quartered in the fire-house, at least while on duty. When an alarm strikes the men slide down a pole from their quarters above, the horses spring into their places in front of the engine or other apparatus, the harnesses are lowered and secured, the doors fly open, and men, horses, and apparatus are on their way to the fire in a few seconds' time.

Scaling-ladders enable firemen to work their way up from one window to another of a burning building to rescue persons whose lives are in danger, and *life nets* are stretched below to catch without injury any who are obliged to



WATER TOWER (EXTENDED)





HOOK AND LADDER TRUCK (UPPER) WATER TOWER (LOWER)

jump. *Arrow-guns* are used to shoot up cords by means of which ropes may be hoisted for use in escaping from fire.

Respirators are air-filters of wet sponge, cotton, or other material, fastened over the nose and mouth to prevent suffocation on entering a room more or less filled with smoke or gas. They are sometimes called *smoke-protectors,* in which case they may or may not include protection for the eyes. *Fire-armor* may include more or less protection for the whole body, but more commonly, at least in America, it is designed to protect the head only, and to supply air as well. The Vagen-Boder helmet is a sort of fire-armor. A strong helmet fits over the head and neck. A small cylinder or reservoir at the back of the helmet contains compressed air, which, when supplied at normal pressure through proper tubing and accessories, is said to be sufficient for sixty minutes' use. The device is similar to a diver's helmet.

Central offices serve not only as headquarters for the officials of the fire department, but here are also found the various receiving and transmitting instruments mentioned in the article on FIRE-ALARM.

Volunteer fire departments exist in communities too small or too poor to warrant the expense of a *paid fire department.* While the men in paid fire departments give their whole time to the work, those in the volunteer companies serve gratuitously, or with exemption from a part or all of their taxes, dropping their regular work or turning out of bed in the middle of the night in response to the fire-alarm. Able and devoted as is the work of volunteer fire departments, it is often poor economy to rely upon them, particularly in large communities, since it is a well-known maxim that the first few moments or seconds after the outbreak of a fire is the crucial period, and naturally the paid departments, always on duty, can respond more promptly than the volunteer. Finally, it may not be out of place to say that the efficiency of a fire department depends upon the extent to which politics are kept out of questions of control and the principles of civil service observed. Consult: Shaw, *Fire Protection* (London, 1877), a British presentation of the subject; Hill, *Fighting a Fire* (New York, 1897), for an account of the daily life of an American fireman.

FIRE QUARTERS. See FIRE-BILL.

FIRE-SALAMANDER. The common spotted species of salamander in Europe. See SALAMANDER.

FIRE-SHIP, or **FIRE-RAFT.** A floating craft, loaded with combustibles, set on fire and sent among the enemy's ships for the purpose of destroying them by fire or causing confusion. The first recorded use of fire-ships was at the siege of Tyre, B.C. 332, the Tyrians delaying for some months the fall of their city by destroying with fire-ships a mole that Alexander was building. There are numerous other instances of their use before the commencement of the Christian Era, and they seem to have been well known from that time onward. The invention of Greek fire in 673 caused increased use of fire-ships, at first by the Greeks and afterwards by other nations as they became possessed of the secret of manufacture of the compound. In 951, and again in 953, Russian fleets narrowly escaped destruction by fire-ships. During the period of the Crusades their use was frequent. In 1370 the English used them at Zuruckzee. The most notable use of them in early modern history, and the first known use of exploding vessels, occurred at the siege of Antwerp, in 1585. They were both used against a heavy boom defense, but the employment of the exploding vessels was disastrous to their own side. The English used fire-ships against the Spanish Armada at Calais with good effect in 1588. During the seventeenth and eighteenth centuries their use attained a maximum. Soon after the beginning of the nineteenth century the decadence of fire-ships began, and the development of steam and the change from wood to iron in ship-building have nearly destroyed their usefulness.

FIRE-WALK. In several of the Polynesian Islands, notably at Tahiti, is found a fire ceremony intended to insure good crops. Divested of its spectacular features, the ceremony consists of the walking of a priest and other celebrants barefoot across a bed of stones which have been heated upon a mass of burning wood. That this surprising feat, which has been described as a marvel, is susceptible of a rational explanation, has been shown by Secretary S. P. Langley, of the Smithsonian Institution, who observed the ceremony at Tahiti in 1901. It was ascertained that the volcanic rock employed is a poor conductor of heat, so that while the stones of the ceremonial 'taro oven' may be intensely hot underneath, the upper part will be only moderately warm. (See *Nature,* August 22, 1901.) A similar ceremony has been practiced in Japan. The stories bordering on the marvelous which have been told about ordeals by fire (see ORDEALS) will be found, on examination by competent observers, to admit of simple explanation.

FIREWORKS. See PYROTECHNY.

FIRE-WORM. A caterpillar which devours foliage, leaving the trees looking as if a fire had swept over them. The spring canker-worm (q.v.) and the Rhopobota vacciniana are examples.

FIRE-WORSHIP. Devotion paid to fire as a sacred element, and one of the earliest objects of worship among mankind. This widespread cult, like sun-worship, earth and water veneration, may be recognized in many phases from primitive ages to the present day, from savagery to civilization. A distinction between the primitive fetish-worship of the physical fire itself and the more advanced conception of a divinity or fire-god behind the flaming manifestation is not always easy to draw among the nations that have paid reverence to this element. It is easy, however, to see how fire as an incarnation of light opposed to darkness, and as a power so beneficent, and yet on occasion maleficent, would be a natural object of veneration. Nor is it difficult to understand the devoted care and pious attention early bestowed upon the cherished flame sprung from the spark so hard to obtain and so difficult to maintain. It was this that made the fire, which was preserved for the general good on an altar or in a shrine, the focus of the early community, and made the domestic hearth the centre and symbol of the home and family. Special functions, or time-honored rites, were associated with the production and keeping of the fire, and those who ministered upon it, as its worship developed, came to be holy and powerful priests as the guardians of a divine gift.

The savage tribes of American Indians, like the rude natives of West Africa, paid homage to a fire-spirit as ancestor, and, as Tylor has pointed out, the Polynesians and Mexicans acknowledged in their worship a fire-god akin to the divinity of the sun. The worship of Moloch in ancient Canaan was a form of homage to the genius presiding over fire; and hallowed rites to the fire were performed among the Egyptians, Assyrians, Chaldæans, and the less civilized Mongolian tribes.

Nearer to our own race, however, was the veneration shown for fire among the early Indo-Germanic peoples. In India of old, for example, there was an elaborate fire ritual; sacrifice to the fire was one of the first acts of morning devotion; and the hymns addressed to the fire-god Agni (q.v.) in the Rigveda outnumber those in praise of any other divinity. In Greece and Rome likewise, the fire-cult of Hestia or Vesta, and of Hephæstus or Vulcan, was a marked feature in the religion. The Slavic race, including Old Prussians, Lithuanians, and Russians, preserve reminiscences of earlier fire-worship. But in this respect most important among the members of the Indo-European family are the Persians.

In Iran from the earliest times the care of the fire was so scrupulous and so elaborately developed that it formed the most noticeable characteristic of the ancient Persian faith. The religion of Zoroaster (q.v.) is sometimes, therefore, called fire-worship, but erroneously, as the Parsis or modern adherents of the creed insist. It is certain that in the *Avesta* (q.v.) the fire played a most prominent rôle; it was personified as the 'Son of Ormazd,' and inconceivable pains were taken to preserve the sacred element from defilement. The regular name for a priest in the Zoroastrian scriptures is *āthravan*, 'belonging to the fire'; and Greek writers describe how the fire was carried in state processions before the Persian kings, for it was a symbol of the divine presence and of national feeling. The extinction of the holy flame in the temples, when the Mohammedans conquered Persia, was synonymous with the downfall of Iran. The sacred fire which the Parsis (q.v.) carried with them from Persia to India when they fled as religious exiles was to them an outward sign of their nationality as it was of their faith—a palladium of the worship of Ormazd. As Zoroastrianism apparently sprang up first in the neighborhood of the Caspian Sea with its oil-wells and petroleum-fountains, one may imagine that this fact may have had some influence on the early Persian faith, and there are Parsis or Ghebers (q.v.) that still do reverence to the eternal flame that leaps from the earth at Baku on the Caspian shore. It is interesting to add that near Rawl Pindi in northern India there is a sacred fire cherished by Mohammedans, which is unusual for Islam, and it has been supposed that this may show evidence of influence exerted by early Persian fire-worship combined with the old fire-cult of India itself. Whatever may have been in olden times the feeling or attitude of the Persians in their worship or veneration of fire, or whatever were the views that made the victorious Mohammedans brand them as idolaters and fire-worshipers, the modern Zoroastrians of India reject such a title and emphasize that they look upon fire as a sign or symbol, as a manifestation of the divine power, purity, and essence. It may be added in conclusion that *pyrolatry* as a scientific designation is sometimes employed to designate fire-worship. Consult: Tylor, *Primitive Culture* (London, 1873); A. Kuhn, "Herabkunft des Feuers," in his *Mythologische Studien* (2d ed., Gütersloh, 1886); Zaborowski-Moindron, "Le feu sacré et le culte du foyer des Slaves contemporains," in *Société d'Anthropologie de Paris Bulletins et Mémoires*, series 5, vol. i., pp. 530-534 (Paris, 1900).

FIRE-WORSHIPERS. See Ghebers.

FIRISHTA, fė-rēsh'tȧ, Muhammad Qasim Hindū Shāh (1570-?). A celebrated Persian historian. He was born at Astrabad, on the Caspian Sea. At a very early age he went with his father (Ghulam Ali Hindu Shah) to India, where we find him, when twelve years old, at Ahmednagar, in the Deccan. He afterwards became captain in the bodyguard of Murtada Nizam Shah; and when this King was deposed by his own son, Firishta went to Bijapur (998 A.H., A.D. 1589), where Ibrahim Adil Shah II., the reigning monarch, received him with great honor. Soon after his arrival Firishta is mentioned as taking part in an action against Jamal Khan, in which the historian was wounded and taken prisoner; but ere long he made his escape. His death is supposed to have taken place shortly after the year 1612. His great work is the *Tarikhi Firishta*, a history of the Mohammedan power in India. Written with an impartiality, simplicity, and clearness rare in an Eastern work, this history has become a standard work on the subject, into which it was the first to enter at length. Single portions of it have been translated by Dow, Scott, Stewart, Anderson, etc.; but the whole work was first edited by Briggs (Bombay, 1831), and also translated by him under the title, *The History of the Rise of the Mahometan Power in India* (London, 1829).

FIRKIN (ODan. *firken*, multiple of four, from *fire*, four, OHG. *fior*, *fier*, Ger. *vier*, Goth. *fidwor*, AS. *fēower*, Eng. *four;* connected with Ir. *cethir*, OChurch Slav. *chetyri*, Lith. *keturi*, Lat. *quattuor*, Oscan *petur*, Gk. τέσσαρες, *tessares*, Skt. *catur*, four). An old measure of capacity containing nine gallons (old ale and beer measure). But previous to the year 1803 it had two values, being estimated at eight gallons in old ale measure and at nine in old beer measure. The firkin is equivalent to nine and one-seventh imperial gallons. See Weights and Measures.

FIRMAMENT (Lat. *firmamentum*, from *firmare*, to strengthen, from *firmus*, firm). A word used to denote the vault of heaven. The term found its way into English from the Vulgate, which renders the Septuagint στερέωμα, *stereōma*, and the Hebrew *raqi'a* by the Latin *firmamentum* (Gen. i. 6). *Raqi'a* (from the verb *raqa'*, to extend) signifies whatever is beaten or stretched out, and was especially employed by the Hebrews to denote the hemisphere above the earth, compared (Ex. xxiv. 10) to a splendid and pellucid sapphire. Elsewhere (Ez. i. 22-26) it is spoken of as the 'floor' on which the throne of the Most High is placed. Hence it follows that the notions of solidity and expansion were both contained in the Hebrew conception of the firmament (Job xxxvii. 18). The blue ethereal sky was regarded as a solid sphere, to which the stars were fixed, and which was constantly revolving, carrying them with it. This sphere or firmament rested on the loftiest mountains as pillars and divided the waters which were under the firmament from the waters which were above the firmament; and the theory of the phenomena of rain, etc., was that there were 'windows in heaven'—i.e. in the firmament—through which, when opened, the waters that were above the firmament descended (Gen. vii. 11; II. Kings vii. 2, 19; Ps. lxxviii. 23 and cxlviii. 4). Similarly, under the earth there was another sea, called the 'deep' or 'great deep.' The view entertained by the Greeks and other early nations was essentially the same. It is most probable, at least in the case of the Jews and the Babylonians, that both views are traceable to the same original source. In the progress of astronomical observations it was found that many of the heavenly bodies had independent motions inconsistent with the notion of their being fixed to one sphere or firmament. Then the number of crystalline spheres was indefinitely increased, each body that was clearly independent of the rest having one assigned to it, till a complex system was introduced capable of being fully understood only by the philosophers who devised it. See Ptolemaic System.

FIRMAN, fẽr′man *or* fẽr-män′ (Pers. *farmān*, Skt. *pramāṇa*, authority, norm, from *pra*, forth + *mā*, to measure). A word used by the Turks to denote any official decree emanating from the Ottoman Porte. Its employment in Persia is as old as the time of Darius, who in the Old Persian inscription speaks of his commands or statutes as *framāna*. The right of signing any firman relating to affairs connected with his special department is exercised by every minister and member of the divan, but the office of placing at the head of the firman the *thograï*—a cipher containing the name of the Sultan in interlaced letters, and which alone gives effect to the decree—is committed to the hands of a special minister, who is called *nichanji effendi.* The name applied to such decrees as have been signed by the Sultan himself is *hatti-sherif* (q.v.). The name firman may also signify a more formal kind of Turkish passport, which can be granted only by the Sultan or by a pasha. A written permission to trade is also called in India a firman.

FIRMENICH-RICHARTZ, fēr′me-nĭk rēk′ärts, Johannes Matthias (1808-89). A German author and Germanic scholar, born in Cologne, and educated at Bonn and Munich. He was distinguished as a playwright and poet. In 1860 he was appointed professor in Berlin, where he published his principal work, *Germaniens Völkerstimmen* (3 vols., 1843-66; supplementary volume, 1867).

FIRMIAN, fẽr′mē-ȧn, Karl Joseph, Count (1716-82). An Austrian statesman. He was born at Deutschmetz, Tyrol, and was educated at Erthal, Innsbruck, Salzburg, and at the University of Leyden. After traveling in France and Italy, he returned to Austria upon the accession of Francis I. to the Imperial throne of Germany, and was sent by Maria Theresa as Ambassador to Naples, and as Governor-General to Lombardy in 1759, where he did much to encourage science and the arts. He was a patron of Winckelmann, of Angelica Kauffmann, and of many other scholars and artists. Many libraries were erected by him, while his own collection of 40,000 volumes (catalogue in 10 vols., published in 1783 under the title *Biblioteca Firmiana*) was always accessible to investigators, and was later in part incorporated with the Brera Library in Milan.

FIR′MICUS MATER′NUS, Julius. A Latin author of the fourth century, a native of Sicily, who, about A.D. 350, wrote eight books on astrology (*Matheseos Libri VIII.*), in which he formulated a complete theory of astronomical superstition, in the spirit of the Neo-Platonists. The work was first published in the *Astronomici Veteres* (1499), and subsequently by Pruckner (1533 and 1551). Another edition is that of Sittl (1894). He has been identified, probably erroneously, with a Christian controversialist of the same name, who, about A.D. 347, addressed to the sons of Constantine the Great a work entitled *De Errore Profanarum Religionum*, treating of the false fanaticism of paganism, and counseling its complete annihilation. The latest edition of the latter work is that of Halm, in vol. ii. of the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1867).

FIRMIL′IAN. A dramatic poem by W. E. Aytoun (1854), described as a 'spasmodic tragedy,' and written in ridicule of the extravagant subjects and mannerisms of Bailey, Dobell, and Alexander Smith.

FIR′MIN, Thomas (1632-97). An English philanthropist, born at Ipswich. In 1662 he raised money for the Polish exiles of the Unitarian belief, and in 1681 for the Polish Calvinists when they shared the same fate. But he was better known for his charities at home, and especially for the employment he provided (1665) in London to help needy workmen after the plague, and again after the fire. From 1676 he devoted himself entirely to philanthropic schemes of various kinds. He built a linen factory, where a little later he employed seventeen hundred workmen, and in 1682 he established a second factory at Ipswich to help the refugees from France, besides making large collections for them. From 1673 to his death he was a governor of Christ's Hospital, save for a break caused by his opposition to James II. In politics he seems to have been Republican, but was an ardent admirer of William III.; and in theology he was an anti-Trinitarian, though he never left the English Church. He wrote *Some Proposals for the Imploying of the Poor, especially in and about London, and for the Prevention of Begging* (1678; reprinted in 1681, and in 1787 in *Tracts Relating to the Poor*).

FIRMINY, fẽr′mē′nē′. A town in the Department of Loire, France, 45 miles by rail from Lyons (Map: France, L 6). It is situated in a coal-mining region, and manufactures steel and other metal articles and ribbons. Population, in 1901, 16,903.

FIRM ISLAND. In *Amadis de Gaul*, an enchanted island, where the marriage of Amadis and Oriana took place.

FIR′MISTER′NIA, fẽr′mĭ-stẽr′nĭ-ȧ. A division of the tailless Amphibia (Anura), which includes those tongue-possessing frogs (the families Ranidæ and Engystomatidæ), in which the two halves of the shoulder-girdle meet in the middle line and form a firm median bar. (This is contrary to the case in the correlative division Arcifera, in which the two halves of the shoulder-girdle overlap on the ventral side, and are to some extent movable upon one another, allowing the thorax to expand and contract.) The firmisternal type "is morphologically the higher and more recent, and passes in the larval stage through the arciferous condition." It is characteristic also of the Aglossa (q.v.). Cope and Boulenger regard the Firmisternia and Arcifera as a suborder, equivalent to the Aglossa and others; but the latest revision of the classification of the Anura (Gadow, 1901) makes Firmisternia and Arcifera divisions of the suborder Phaneroglossa, or tongue-bearing frogs and toads. The Phaneroglossa and the Aglossa constitute the Anura. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

FIROZPUR, fē'rôz-pōōr', or **FEROZEPORE**, fē'rôz-pôr' (Hind., City of Firuz, so called from its founder, Firuz Toghluk, who reigned in Delhi from 1351 to 1388). The capital of a district of the same name in the Punjab, British India, situated three miles from the southeast bank of the Sutlej (Map: India, B 2). At one time a large and important town, as its massive fortifications and extensive ruins indicate, it had sunk into poverty and insignificance before it came into the possession of the English in 1835. Since then the place has regained much of its former importance. It has wide streets and colonnaded bazars, and is a thriving emporium of commerce. The city contains a monumental church in memory of officers and privates who fell in the various conflicts with the Sikhs, and it is the seat of a well-equipped arsenal and an important cantonment. Population, in 1901, 50,437.

FIRS. See FURS.

FIRSTBORN (translation of Heb. *bekor*, from *bakar*, to break forth). In biblical usage, a term which signifies the first male offspring, whether of man or of other animals. The Hebrew stem *bakar* is used also for the first fruits of trees or of produce of the field. (See FIRST FRUITS.) The firstborn male was devoted from the time of birth to God. In the case of firstborn male children, the law required that, within one month after birth, they should be redeemed by an offering equivalent in value to five shekels of silver (Exod. xiii. 13; Num. xviii. 15-16). If the child died before the expiration of 30 days, the obligation of redemption ceased; but if that term were completed, the obligation was not extinguished by the subsequent death of the infant. This redemption took place according to a fixed ceremonial. It is difficult to say in how far these laws of redemption point to the existence in earlier days of the actual offering of the first male child to a deity. Traces of such offerings are found, but the instances appear to be exceptional—as in moments of great danger (II. Kings iii. 27). On the other hand, the narrative of Abraham's readiness to sacrifice Isaac would lose part of its meaning if the rite was really resorted to only under exceptional circumstances. The rite of circumcision may also be a modification of an original offering of the firstborn (see CIRCUMCISION), but it is also likely that the symbol replacing the reality was introduced at a comparatively early age—long anterior to the separation of the Hebrews in their religious customs from their fellow Semites.

The firstborn male of animals also, whether clean or unclean, was equally regarded as devoted to God. The firstborn of clean animals, if free from blemish, was to be delivered to the priests within twelve months after birth to be sacrificed to the Lord (Deut. xv. 19-21); nor was it permitted to any but the priests to partake of the flesh of such victims (Num. xviii. 15-19). If the animal were blemished, it was not to be sacrificed, but to be eaten at home (Deut. xv. 22). The firstborn of unclean animals, not being a fit subject for sacrifice, was either to be put to death or to be redeemed with the addition of one-fifth of its value (Lev. xxvii. 27; Num. xviii. 15). If not redeemed, it was to be sold, and the price given to the priests.

Primogeniture, both by the patriarchal custom and by the Pentateuchal codes, had certain privileges attached to it, the chief of which were the headship of the family and a double portion of the inheritance (cf. Deut. xxi. 16, 17). 'Firstborn' was a title of honor or affection (Exod. iv. 22; Jer. xxxi. 9). The Hebrews shared with the other Semites a belief in the sanctity of first fruits in general which may properly be traced back to a natural feeling of rejoicing and gratitude. Hence even among Semites in a nomadic state, special privileges are accorded to the firstborn, and to barter away one's birthright was regarded as a disgrace. In this respect, the story of Esau's selling his birthright for a mere mess of pottage—an act which the writer holds up to scorn (Gen. xxv. 29-34)—well reflects the general view. As a people advances from the nomadic to the pastoral, and thence to the agricultural stage, the views connected with the firstborn are naturally extended to animals, and to produce of the fields. Hence in the Pentateuchal codes, which are based on the agricultural stage, ample provisions are made for rites connected with the various classes of 'first' productions. See FIRST FRUITS; FAMILY; SUCCESSION; PRIMOGENITURE.

FIRST FRUITS (translation of Heb. *reshith*, or *bikkurim*, first, best). That portion of the fruits of the earth, and other natural produce, which, by the usage of the Hebrews and other ancient nations, was offered to the Deity, as an acknowledgment of His supreme dominion, and a recognition of His bounty. (Consult Frazer, *Golden Bough*, vol. ii., London, 1890.) Among the Hebrews the institution of first fruits comprised both public and private offerings. The regulations are set forth in the several codes of the Pentateuch. Taking these codes together, the regulations may be summarized as follows:

Of the public class there were three principal offerings. The first was at the opening of the corn harvest. On the day after the first day of the Passover, the 16th of the month Nisan, a sheaf of new corn, which was cut and gathered with much solemnity, was carried to the holy place, and there waved before the altar (Lev. xxiii. 40 sqq.); nor was it permitted to commence the harvest work till after this solemn acknowledgment of the gift of fruitfulness. Again, at the feast of Pentecost, seven weeks later, two loaves of leavened bread, made from the flour of the new harvest, were waved, with a similar form of worship, before the altar (Ex. xxxiv. 22; Lev. xxiii. 15-17). Thirdly, at the

Feast of Tabernacles, in the seventh month, was held the great feast of the gathered-in harvest, the final acknowledgment of the bounty of God in the fruits of the year (Ex. xxiii. 16; Lev. xxiii. 33-34).

Besides these public offerings of first fruits on the part of the entire people, individual Hebrews were bound to private offerings, each upon his own behalf. A cake of the first dough, one-twenty-fourth of the amount, was to be offered to the Lord (Num. xv. 21). The 'first of all the fruits' were to be placed in a basket, and carried to the appointed place, where the basket was to be offered with a prescribed formula, commemorative of the sojourn of Israel in Egypt, and of his deliverance by the strong hand (Deut. xxvi. 2 sqq.). Fruit-trees were given three years for growing, then the fruit of the fourth year was to be given to God (Lev. xix. 23-25). All these offerings were divided into two classes—the first, which were called *bikkurim,* comprised the various kinds of raw produce, of which, although the law seems to contemplate all fruits, seven sorts only were considered by the rabbis to fall under the obligation of first-fruit offering—viz.: wheat, barley, grapes, figs, pomegranates, olives, and dates. He who lived near Jerusalem brought fresh fruits; others could bring them dried. It was customary for offerers to make their oblations in companies of twenty-four, and with a singularly striking and effective ceremonial. The second class, the *reshith,* were brought of prepared materials, dough, wine, oil, etc. The *terumoth* were taxes consisting in the first ripe of the fruit, whether of the ground or of trees, levied for the support of the priests. There was no definite amount. Between one-fortieth and one-sixtieth of the harvest could be given, but it does not appear that this regulation was ever strictly carried out except by a small minority of pious devotees, just as various other provisions of the Priestly Code remained a dead letter. With the destruction of the second temple, all offerings and sacrifices were abolished, though among orthodox Jews, as a reminiscence of the temple cult, a portion of the dough for baking bread is still thrown into the fire.

Offerings analogous to the Jewish first fruits became usual very early in the Christian Church, as is clear from a passage in Irenæus (*Adv. Hær.* iv., 17 and 34); but the extent to which they prevailed, and the amount and general character of the oblation, are exceedingly uncertain. It appears to have been merged in the legal provision established by the emperors.

The mediæval ecclesiastical impost known under the name of *primitiæ,* or first fruits, and sometimes of *annates* or *annalia,* was entirely different. By the word, in its mediæval and modern sense, is meant a tax imposed by the popes on persons presented directly by the Pope to those benefices which, by the canonical rules, or in virtue of privileges claimed by them, fall within the Papal patronage. Persons so presented were required to contribute to the Roman See the first fruits (that is, the income of the first year) of their benefice. During the residence of the popes at Avignon, when the Papal necessities compelled the use of every means for eking out a precarious revenue, it was sought to extend the impost to every benefice; and this claim was the subject of many contests, especially in Germany and in England, where the claim, so far as regarded direct Papal presentation, had existed from the reign of King John. Henry VIII. withdrew the right of the first fruits from the Pope, in order to transfer it to the King; and he established a special court for the administration of first fruits, which, however, was soon abandoned. In the reign of Anne, the revenues arising from this impost in England were vested in a board, to be applied for the purpose of supplementing the incomes of small benefices. In France this tax was abolished by the 'pragmatic sanction' enacted at Bourges in 1438, and subsequently by the concordat of Leo X. with Francis I. in 1516. In Spain it ceased partially in the reign of Ferdinand and Isabella, and finally under Charles V. In Germany it formed one of the first among the *centum gravamina* presented to the Emperor in 1521, and the claim ceased altogether from that period. Consult the Hebrew Archæologies of Nowack (Freiburg, 1894) and Benzinger (ib., 1894); Robertson Smith, *Religion of the Semites* (London, 1894). See Firstborn.

FIRST GENTLEMAN OF EUROPE. A title given to King George IV. of England.

FIRST GRENADIER OF FRANCE. A title given to Latour d'Auvergne (q.v.).

FIRTH, or **FRITH.** A name used in Scotland for deep inlets of the sea, in many cases of estuarine formation. The term firth is similar to the Norwegian 'fiord,' an inlet with high rocky walls; the Scottish firths often have the characteristics of fiords. See Estuary; Fiord.

FIRTH, Charles Harding (1857—). An English historian, born in Sheffield. He studied at Balliol College, Oxford, where he became a scholar in 1876 and an instructor in 1883. From 1887 to 1893 he was a lecturer at Pembroke College, Oxford; in 1900 he became Ford's lecturer in English history in the University of Oxford, and in 1901 Fellow of All Souls' College there. His writings include: *Oliver Cromwell and the Rule of the Puritans in England* (1900); and *Cromwell's Army, a History of the English Soldier During the Civil War, the Commonwealth, and the Protectorate* (1902). He edited a number of historical and biographical works, among which are: *Scotland and the Commonwealth; Letters and Papers Relating to the Military Government of Scotland, 1651-53* (1895); and its sequel, *Scotland and the Protectorate, 1654-59* (1899).

FIRTH, Mark (1819-80). An English steel manufacturer and philanthropist, born at Sheffield. He left school at the age of fourteen to enter the steel-works where his father was employed. In 1843 he established his own business, which soon became very extensive and acquired a considerable trade in America. The firm manufactured steel blocks for ordnance, spherical and elongated shot, and every variety of heavy forgings for engineering requirements. The manufacturing and refining of steel from Swedish iron was successfully carried on; and nearly all the steel used in making English guns was produced by this firm. Firth was also celebrated as a public benefactor. His numerous gifts and endowments include the Mark Firth's Almshouses at Ranmoor, erected at a cost of £30,000, and consisting of thirty-six houses, left as a permanent legacy to the poor of Sheffield; a freehold park of thirty-six acres for a recreation ground (opened by the Prince and Princess of Wales, August 16, 1875), and the Firth College, erected at a cost of

£20,000 and furnished with an annual endowment of £5000 (opened by Prince Leopold, October 20, 1875).

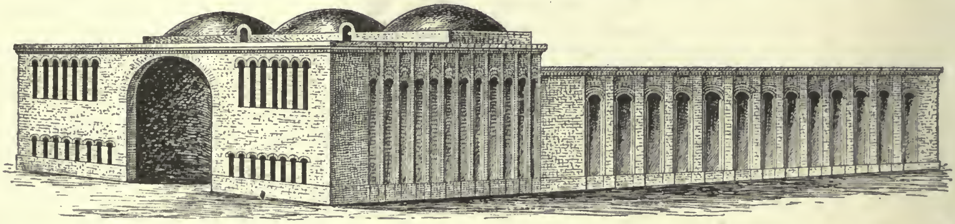
FIRTH OF FORTH. See Forth.

FIRUZ I., fē′ro͞oz. One of the Arsacide kings of Persia, who reigned 83-103. He is also called Arsaces XXIV., King of Parthia, and is identified with Pacorus II. of the classical writers.

FIRUZ II. (459-484). A king of Persia, of the Sassanide dynasty. He overthrew and put to death his younger brother, Ormazd III., and so came to the throne. The reign of Firuz was unhappy. The Hephalitæ, or White Huns (so called to distinguish them from the true Huns), threatened the kingdom. The Persians undertook two expeditions against them, but were unsuccessful in both, and in the second one Firuz and 29 of his sons were slain.

FIRUZ III. (?-679). The last of the Sassanides of Persia. He was expelled from Persia by the new Mohammedan power on the defeat of his father, Yezdegird III., in 641, and took refuge with the Emperor of China, Kao-Tsung, who vainly endeavored to restore him to the Persian throne.

FIRUZABAD, fē-ro͞o′zȧ-bȧd. A Sassanian palace, erected by King Firuz (460-494). The length was approximately 342 feet and the breadth 178. The plan of the building was rectangular, the entrance being on the north side, where there was a great porch. Within there were reception-rooms; behind these, three rooms arranged horizontally, each having a vaulted dome, and in the rear was an open court with rooms on its four sides. The walls, which were enormously thick, were constructed of rough stone, the vaulting was of brick, and plaster was used to finish off the surfaces. The general style of architecture shows traces of Mesopotamian, Byzantine and Roman influences, the particular features being copies of decorations in Persian palaces, the use of blind arches, and a zigzag molding of projecting bricks.



PALACE OF FIRUZABAD.

FIRUZBADI, fē′ro͞oz-bä′dē, Medjed ed Din (1329-1417). A Mohammedan lexicographer, born at Karisin, near Shiraz. Several educational institutions at Medina and Mecca were founded by him. Four years after his meeting with Timur at Shiraz (1382) he was appointed chief cadi of Yemen, which position he retained until his death. He achieved celebrity through his great lexicographical work *Kamus* ("The Ocean"; best edition by Nasr-ed-Hurini, 4 vols., 1301-02 of the Hejira). The work has also been translated into Turkish (3 vols., 1230-40 A. H.) and Persian (Calcutta, A.D. 1840).

FIRUZ SHAH, fē′ro͞oz shä. The son of the King of Persia in the story of "The Enchanted Horse" in the *Arabian Nights*, who recovers his bride from the Sultan of Cashmere by the aid of the enchanted horse.

FIRUZ SHAH I., Rukn ud-Din. A Mohammedan king of Delhi. He succeeded his father, Shams ud-Din Altamsh, in A.D. 1236, after having been governor of Lahore. He was deposed in the first year of his reign by his sister, the Sultana Raziyyat.

FIRUZ SHAH II., Jalal ud-Din (?-1296). The founder of the Khalji dynasty of the Mohammedan sultans of Delhi. Succeeded to the throne in 1290, his brief reign was stormy. He sacked Ujjain in 1291, and having already made an invasion of Malwa, he again plundered it in 1293. In 1296 he was assassinated by his nephew Ala ud-Din, who two months later succeeded to the throne.

FIRUZ SHAH III. (1296-1388). King of Delhi. He succeeded Mohammed II. ibn Tughlaq III., in 1351. His reign was tranquil, and his country prosperous. In 1386 he abdicated, and two years later he died.

FISC (Fr. *fisc*, from Lat. *fiscus*, treasure-chest). The public treasury. The Latin term was originally applied to the private purse of the Emperor, to distinguish it from the public treasury, or *ærarium*. Later it came to designate the Imperial treasury, in contradistinction to the private property of the ruler, in which sense it is employed in modern countries whose jurisprudence is derived from the civil law. The fisc is considered in law as an ideal or juristic person. It has a legal right to all the State revenues, including those derivable from forfeitures. In suits against it by a subject, all questions of doubt are to be resolved in favor of the subject. Consult: Bracton, *De Legibus et Consuetudinibus Angliæ* (Twiss ed., London, 1878-83); Spelman, *Glossarium Archaiologicum* (London, 1867); *Molina* v. *United States* (6 *Court of Claims Reports*, 209, 1870); Sohm, *Institutes of Roman Law* (Oxford, 1892).

FISCHART, fĭsh′ärt, Johannes (c.1545-c. 91). The great German satirist of his century, also a Protestant reformer. A doctor of the University of Basel (1574), his literary activity was confined chiefly to the years 1575-81, after which he became absorbed in his duties as advocate at the Imperial Court at Speier, and as local magistrate (1583) at Forbach, where he died. Some fifty of the satires attributed to him are authentic. They are directed against the Pope, the Jesuits, vicious priests, the aristocracy, pedants, astrologers, and folly of every kind. His most famous works are the Rabelaisian *Aller Praktik Grossmutter* (1572); *Eulenspiegel Reimensweiss*

(1572); *Affenteurliche und ungeheuerliche Geschichtschrift . . . von Gargantua und Pantagruel* (1575); the coarsely comic parody of the animal-epic, *Flöhhatz, Weibertratz* (1574); the anti-clerical *Bienenkorb des heiligen römischen Imenschwarms* (1579, suggested by the *Bynencorf* of the Dutch Marnix); *Der heilige Brotkorb* (1580), an imitation of Calvin's *Traité des reliques; Das vierhörnige Jesuiterhütlein* (1580); the genially comic *Das glückhafft Schiff von Zürich* (1576). Consult studies of Fischart by Wackernagel (Basel, 1874), Wendeler (Halle, 1879), and Besson (Paris, 1889).

FISCHBACH, fĭsh′bäg, Friedrich (1839—). A German pattern-designer, born at Aix-la-Chapelle. He was educated at Cologne and at the Academy of Design in Berlin, and in 1862 went to Vienna, where he prepared drawings for the collection of pattern-designs in the Austrian Museum. In 1870 he was appointed teacher of ornamentation at the Royal Academy in Hanau. He was director of the newly organized Industrial Art School at Saint Gall from 1883 to 1888. Several societies for the advancement of industrial art were established by him; and he was influential in establishing the independence of Germany in the field of pattern-drawing. His collection of antique fabrics and embroideries was acquired by the school at Saint Gall. His principal literary works include: *Ornamente der Gewebe* (with 160 colored plates, 1874-81); *Geschichte der Textilkunst* (1883); *Südslawische Ornamente* (2d ed. 1872); *Album für Stickerei* (130 patterns, printed in gold and colors, 4th ed. 1872); *Neue Muster für Stickerei und Häkelarbeiten* (3 series, 1880-83); *Stickereimuster* (4 parts, 1888); *Häkelvorlagen* (1889); *Weissstickereivorlagen* (1892).

FISCHER, fĭsh′ẽr, Emil (1852—). A German chemist, born at Euskirchen. He studied at Strassburg, and in 1879 was made professor extraordinary at the University of Munich. Three years later he was appointed full professor of chemistry at Erlangen, and in 1885 was invited to take a similar position at Würzburg. When, on the death of the celebrated A. W. Hofmann, the chair of organic chemistry at the University of Berlin became vacant, Fischer was appointed to fill the vacancy (1892). His most important achievement was the synthetic production of the simple sugars and the complete demonstration of their chemical constitution. Although he did not succeed in synthesizing ordinary cane-sugar and the more complex carbohydrates (such as cellulose and starch), his researches have thrown much light on their chemical constitution and have thus paved the way for future success. His *Anleitung zur Darstellung organischer Präparate* (5th ed. 1896) is well known to every student of organic chemistry. In 1902 he received the Nobel prize for distinguished research in chemistry.

FISCHER, Gustav Adolf (1848-86). A German African explorer, born at Barmen. In 1876 he accompanied the Denhardt East African Exploring Expedition to Zanzibar, and in the following year explored Witu and the Southern Galla country. In 1878 he continued his journey to Wapokomoland and along the Tana River to Massa. With the support of the Geographical Society of Hamburg he visited the Massai country in 1882, and penetrated from the mouth of the Pagani to Lake Naivasha. Equipped with funds by the brother of Junker, an explorer, who, with Emin Pasha and Casati, had been lost in the equatorial provinces, he organized a relief expedition, which, however, was compelled to return after reaching Lake Victoria Nyanza. Shortly after his arrival in Germany in 1886, he died of a bilious fever contracted during this journey.

FISCHER, Jean Chrétien (c. 1716-62). A German soldier in the French service. He was a leader of the partisans in the French Army during the war of the Austrian Succession. In 1743 he was authorized by the Marshal de Belle-Isle to raise a company, which was called Fischer's *chasseurs,* the origin of that branch in the French Army. He distinguished himself in the Seven Years' War; was made brigadier for his bravery at Arloff (1759); added to his fame at Clostercamp (1760); resigned his command to the Marquis de Conflans (1761), but still fought in his old troop with the rank of a lieutenant-colonel.

FISCHER, Johann (c.1650-1721). A German composer, born in Suabia. He was kapellmeister to the Duke of Mecklenburg-Schwerin, and later to the Margrave of Schwedt. He wrote various collections of songs, the most important being one of fifty French songs, and one of madrigals and German songs.

FISCHER, Johann Georg (1816-97). A German poet, born at Gross-Süssen, Württemberg. He taught at Langenau, Ulm, and Stuttgart, and in 1860 was appointed professor at the high school in the latter city. As a poet, Fischer may be regarded as the last noteworthy representative of the traditional Suabian School. He was not in sympathy with modern naturalism, and was influenced chiefly by the poetry of his countryman Schiller, although several of his productions suggest the influence of Goethe, Hölderlin, and Mörike. He was in the fullest sense a poet of Nature, whose every mood he portrays in his verses. Scarcely less meritorious are his love poems, of which he composed a great number, and which also are animated by an enthusiastic personification and idealization of Nature in the widest sense. Fischer has been called by his admirers 'Der schwäbische Frauenlob.' Among his principal productions are the following: *Gedichte* (3d ed. 1883); *Aus frischer Luft* (2d ed. 1873); *Neue Gedichte* (1891); *Saul,* a drama (1862); *Friedrich der Zweite von Hohenstaufen,* a drama (1863); *Kaiser Maximilian von Mexiko,* a drama (1868).

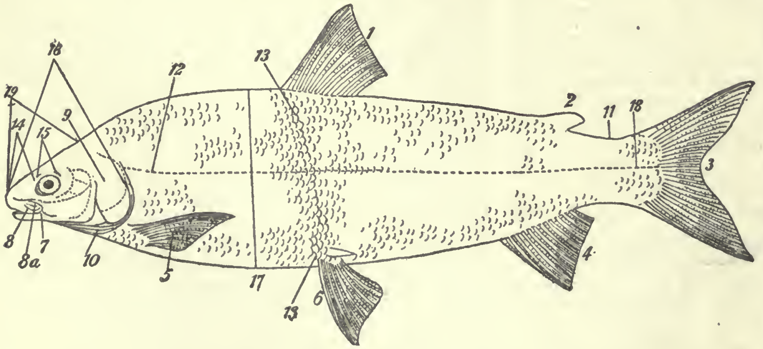
FISCHER, Kuno (1824—). A noted German philosopher and literary critic. He was born at Sandewalde, Silesia, studied at the universities of Leipzig and Halle, in 1850 became a lecturer at Heidelberg, and when his lectureship had been withdrawn in 1853 by direction of the Bavarian Ministry, continued researches at Heidelberg, and was in 1856 appointed a lecturer at Berlin. He had, however, a short time previously accepted the chair of philosophy at Jena, and continued to occupy it until 1872, when he was called to that of philosophy (to succeed Zeller) and modern German literature at Heidelberg. He achieved high distinction as both academic lecturer and author. His philosophical viewpoint is, with some modifications, Hegelian. His chief work is the *Geschichte der neuern Philosophie* (a new edition in

9 vols., 1897 et seq.), at once the most extensive and the most distinguished exposition of the subject. In 1860 his *Kants Leben und die Grundlagen seiner Lehre* lent the first real impulse to the so-called 'return to Kant.' Important among his further publications are: *Schiller als Philosoph* (2d ed. 1891-92); *Lessings Nathan der Weise* (1896); *Baruch Spinozas Leben und Charakter* (1865); *Goethe-Schriften* (1895-1900); *Shakespeare's Hamlet* (1896); and several 'Festreden,' such as *Goethe in Heidelberg* (1899).

FISCHER, LUDWIG HANS (1848—). An Austrian landscape painter and etcher, born at Salzburg. A pupil, at the Vienna Academy, of Lichtenfels in painting, of Jacoby in engraving, and of Unger in etching, he completed his studies traveling in Italy, Spain, North Africa, Egypt, and India, and afterwards settled in Vienna. Besides a number of oil paintings, he executed for the Museum of Natural History nine decorative landscapes (1889). Among a series of etchings and engravings the cycle "Historical Landscapes from Austria-Hungary" is his most remarkable production. He also painted many excellent water-colors, and published *Die Technik der Aquarellmalerei* (7th ed. 1898).

FISCHER, fē'shȧ', PAUL HENRI (1835-93). A French paleontologist and naturalist, born in Paris. Having obtained his doctorate in sciences and in medicine, he was appointed assistant in paleontology at the Museum of Natural History. In 1872 he became assistant naturalist at the same institution. He was at different times president of the Société Géologique de France and the Société Zoologique de France, and in 1880 was a member of the commission for submarine dredging. From 1856 he edited, with Bernardi, the *Journal de conchyliologie.* His publications include *Fauna conchyliologique marine de la Gironde et du sud-ouest de la France* (1865; enlarged by a *Supplément* in 1875), *Recherches sur les Actinies des côtes océaniques de France* (1876), and a *Manuel de conchyliologie* (1885).

FISCHER, fĭsh'ẽr, THEOBALD (1846—). A German geographer, born at Kirchsteitz, Germany, and educated at Heidelberg, Halle, Bonn, and Vienna. He was professor of geography at Kiel from 1879 to 1883, when he took the same chair at Marburg. In 1886 he visited the Tunisian Sahara, and in 1888 made a tour through Morocco and Algeria. In addition to numerous contributions to scientific periodicals, his publications include: *Raccolta dei mappemondi e carte nautiche del XIII. al XVI. secolo* (10 atlases, containing 79 leaves, 1881); *Beiträge zur Geschichte der Erdkunde und der Kartographie in Italien im Mittelalter* (1886); "Die südeuropäischen Halbinseln," in Kirchhoff's *Unser Wissen von der Erde,* vol. iii. (1892).



TOPOGRAPHY OF A FISH.

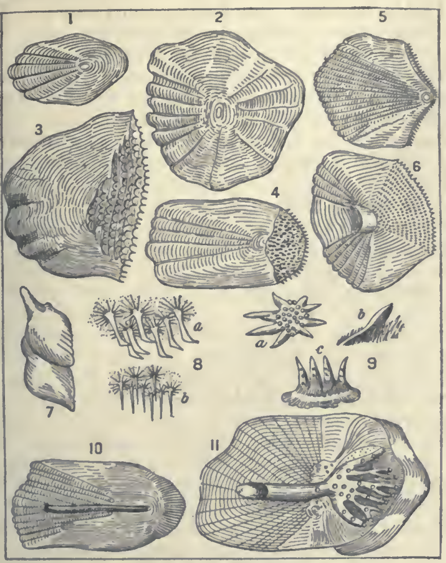
1, Dorsal fin; 2, adipose fin; 3, caudal fin (tail); 4, anal fin; 5, pectoral fin (paired); 6, ventral fin (paired); 7, mandible (lower jaw); 8, maxillary (upper jaw); 9, operculum (gill-cover); 10, branchiostegals: 11, caudal peduncle; 12, lateral line; 13, series of crosswise scales at the point usually counted; 14, snout (nose); 15, eye; 16, head; 17, depth; 18, base of caudal fin; 19, distance from snout to nape or occiput.

FISCHER VON ERLACH, fo̤n ĕr'läg, JOHANN BERNHARD (1656-1723). An Austrian architect, born at Gratz. He studied in Rome, and his work shows the influence of Bernini. He built the Château of Schönbrunn, the summer residence of the Austrian Court; the churches of Saint Charles Borromeo and of Saint Peter; and the palace of Prince Eugene, all in Vienna. He was at work on his history of architecture, *Entwurf einer historischen Architectur* (1721), at the time of his death. JOSEPH EMANUEL (1695-1742), his son, finished the work left uncompleted by his father, and was a remarkable hydraulic engineer.

FISCHER VON WALDHEIM, vält'hīm, GOTTHELF (1771-1853). A Russian physician and naturalist, born at Waldheim, Saxony. After holding a professorship at Mainz, he accepted a call to Moscow (1803), where he became professor of natural history and director of the university museum devoted to that branch of science. In 1808 he founded the Society of Naturalists at Moscow. He published numerous works on comparative anatomy, on the nutrition of plants, and on galvanism. One of the most important of these is the *Bibliographia Palæontologica Animalium Systematica* (2d ed. 1834).

FISH (AS. *fisc,* Ger. *Fisch;* connected with Lat. *piscis,* OIr. *iasc,* fish). A backboned animal which lives in water, breathes by means of gills, and possesses paired fins. Such animals constitute the class Pisces, but popularly the term 'fish' includes, in addition to the above, certain other lower vertebrates, the lancelets (Leptocardii) and the round-mouths (Cyclostomata), not to mention the ignorant error of speaking of whales, etc., as 'fish.'

FORM. It is almost impossible to describe the form of a fish in terms that would include all the different varieties, notwithstanding the fact that the group as a whole presents a greater uniformity of form than other vertebrate groups, for instance, birds. The majority, however, have a more or less elongated body, tapering at both ends. The variations in form can usually be correlated with the habits of the fish. The great variety of habitats into which the fish have been crowded, and to which they have become adapted, has resulted in great diversity of form, though this diversity is mostly concerned with detail, leaving, as stated above, a characteristic fish form as a whole. The typical symmetry of a fish is embodied in such forms as the trout.



FORMS OF SCALES.

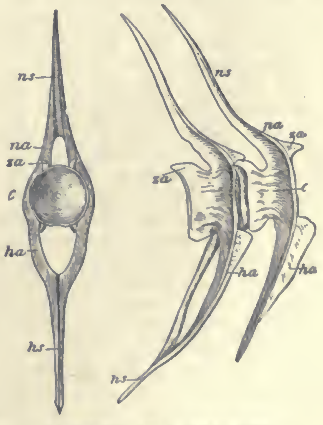
1, 2, Cycloid scales; 3, 4, 5, 6, ctenoid scales; 7, ganoid scales; 8, 9, dermal papillæ (from Monacanthus); 10, 11, cycloid scales from lateral line.

OPEN MOUTH OF A SALMON.

Shows arrangement of maxillary, palatine, and vomerine teeth in fishes.

INTEGUMENT. Fishes are usually covered by scales or bony plates. These may become very minute, as in eels, or may be entirely wanting, as in the leather carp, in certain eels, and in many of the catfishes. Scales may be either bony or horny, and are generally imbricated like slates on a roof, the free end being backward. They arise from the deeper layer of the skin, the derma, grow outward and backward, and remain covered by a thin layer of epidermis. Bony plates are attached by the whole of one surface, and usually have a coat of enamel, which is derived from the epidermis, while the bony base arises from the derma. The differences of character in the scales have been made the basis of a classification of fishes by Louis Agassiz, according to whom all fishes are distributed into four orders — Cycloidei, Ctenoidei, Placoidei, and Ganoidei (qq.v.). This classification was very artificial and did not admit many intermediate cases, or the cases where more than one kind of scale was possessed by the same fish, and has long been disused, but it has been found very convenient in the study of fossil fishes. Here also it is giving way to a more natural classification. The dermal plates may become variously specialized, giving rise to spines, teeth, etc. The teeth vary greatly in size, shape, and arrangement. They may be flat, plate-like, as in the rays, or long and sharp, as in certain sharks. The conditions in the sharks, and in certain other groups, show in the clearest way by their structure and transitional forms that they are merely modified dermal plates or denticles. In the more recent fishes they are not restricted to the edge of the mouth, but may occur in the roof and floor, and on the tongue, gill-bars, and pharynx. The epidermis of fishes contains unicellular glands, which secrete the mucus covering their body, and pigment-cells giving rise to the colors of the body.

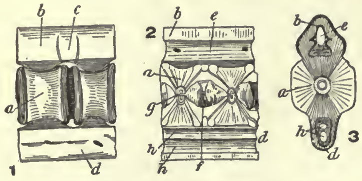
SKELETON. The skeleton of fishes consists of the skull with its visceral skeleton; the vertebral axis with its processes; the pelvic and pectoral girdles; and the supporting elements of the various fins. This in the lower cartilaginous fishes consists only of cartilage, no true bones being present. The skull, which in the higher fishes is a complicated structure, in the elasmobranchs consists of a rather simple cartilaginous hollow case, the chondrocranium, inclosing the brain, and not composed of distinct pieces. As one ascends the scale, bones are added to this chondrocranium from the outside, arising as dermal ossifications; these are probably merely highly modified dermal plates. In the ganoids the chondrocranium generally persists with centres of ossification present, and the whole head is incased in dermal bones. In the higher bony fishes the chondrocranium is usually replaced by cartilage bones with many dermal bones added. To the lower part of the skull in all fishes a series of arches are attached. These form the lower jaw and the hyoid and gill arches. The backbone generally consists of a series of vertebræ which, with the exception of Lepidosteus, are biconcave. Dorsally they bear neural arches inclosing the spinal cord, and these are prolonged dorsally as a neural spine, varying in length. Ventrally, the vertebræ bear ribs in the anterior portion, and in the caudal region there are hæmal arches inclosing the caudal artery and vein. These arches are prolonged ventrally as a hæmal spine. In some elasmobranchs, in the chimæras, in the lung-fishes, and in some ganoids, there are no such definite vertebræ developed, but



VERTEBRA OF A BONY FISH.

Front and side views. *c*, Centrum; *na*, neurapophysis; *pa*, parapophysis; *ha*, hæmapophysis; *ns*, neural spine; *hs*, hæmal spine; *za*, zygapophysis.

the notochord, which in the teleosts persists only as remains in the cavities between the adjoining centra, is a continuous rod. The neural and hæmal arches and the ribs are variously developed. In most of the elasmobranchs there are present definite biconcave vertebræ with neural and hæmal arches, transverse processes, and rudimentary ribs, but they remain cartilaginous or become only slightly ossified. The centra are pierced by a canal through which remains of the notochord are continuous. The posterior end of the spinal column forms the basis of the caudal fin. See SKELETON.



VERTEBRÆ OF A CARTILAGINOUS FISH.

1. Side view. 2. Longitudinal section. 3. Transverse section of caudal vertebra of a shark.

a, Centrum; *b*, neurapophysis; *c*, intercrural cartilage; *d*, hæmapophysis; *e*, spinal canal; *f*, intervertebral cavity; *g*, central canal of persistent portion of notochord; *h*, hæmal canals for blood-vessels.

The fins are supported by cartilaginous or bony rods. In the dorsal and anal these rods do not join those of the internal skeleton directly, but, imbedded in the flesh, are interposed between the spinous processes of the vertebræ. The paired fins, not always all present, represent the typical fore and hind limbs of quadrupeds. They consist of a basal set of bones, varying in number and arrangement in the different groups, bearing the radiating fin-rays, and articulating proximally with the pelvic or shoulder girdle. The girdles are cartilaginous in elasmobranchs, lung-fishes, and sturgeons; but in teleosts this, like the chondrocranium, has additions in the way of dermal bones, which have become associated with it. The pelvic bones may be imbedded in the muscles of the abdomen, or may occur farther anterior and become fastened to the pectoral girdle. In some fishes the pelvic fins, which answer to the hind feet of quadrupeds, are actually farther forward than the pectoral fins, and are then called jugular. In some fishes, as in the common eel, the ventral fins are wanting, while in others both pairs may be absent. In lung-fishes "the skeleton of the pectoral fin consists of a stout basal cartilage, an elongated, tapering central axis made up of a number of short cartilaginous segments, and two rows of jointed cartilaginous rays extending out on either side of the axis." See FIN.

INTERNAL STRUCTURE. The *respiratory organs* of fishes consist of gills, and in the case of Dipnoi, of gills and lungs. In the region of the pharynx the alimentary canal communicates with the exterior on each side by a series of slits called gill-clefts. The water passing through the mouth into the pharynx escapes to the exterior through these gill-clefts. The bars bounding these clefts have attached to them the gills, which are merely the mucous membrane of the bars raised up into a number of ridges, called branchial filaments. These are highly vascular, the blood entering them being venous in character, and they constitute the true respiratory organs. The water passing through the clefts bathes the filaments and effects the necessary interchange of gases. In the lung-fishes the air-bladder has assumed the function of a lung. This organ is not a smooth-walled bag, as in other fishes, but a highly vascular, much-chambered organ. The air enters it through a connection with the pharynx. See GILL; RESPIRATORY SYSTEM.

The *air* or *swimming bladder* of fishes is a sac, usually unpaired, filled with gas and lying dorsal to the intestine. Embryologically it corresponds with the lungs, as it arises as a diverticulum of the intestine, and in this connection may persist as the pneumatic duct, or in other cases may be wholly lost. The function of the air-bladder is not always clear. When it is supplied with venous blood, as in Dipnoi and Amia, and its gases are periodically exchanged for outside air, it doubtless functions as a lung. When it is supplied with arterial blood, or when it is a closed sac, its function is supposed to be hydrostatic. It may, in addition, serve as a storehouse for oxygen taken in by the gills. The contraction and expansion both of the bladder and of the body musculature serve to condense and expand the air in the bladder, and thus may aid the fish in rising or sinking in the water. Unequal anterior, posterior, or lateral pressure on the bladder may likewise aid the fish in directing its course. In some fishes the forked anterior end of the air-bladder fits closely against the posterior wall of the auditory capsule. In carps and siluroids the bladder and auditory organs are connected by a chain of bones. Such connections doubtless enable the fish to become more keenly sensitive to any change in hydrostatic pressure in the bladder.

Except in teleosts, where a conus arteriosus is wanting, the heart of fishes consists of (1) a sinus venosus, (2) one auricle, (3) one ventricle, and (4) a conus arteriosus. In the teleosts the conus is represented by the bulbus arteriosus, which, however, is a part of the aorta and does not undergo rhythmical contraction like the conus. The sinus venosus is a thin-walled expansion of the afferent veins, and a sort of antechamber to the thin-walled auricle. From the latter the blood passes into the thick-walled, muscular ventricle; thence either into the ventral aorta (teleosts) or into the conus. From the conus the ventral aorta extends forward a short distance, and then divides on each side into a number of branches (afferent branchial arteries), which pass through the gill-arches, breaking up there into capillaries in the gill-filaments, which re-collect into the efferent branchial arteries. These unite above the pharynx as a single large artery, the dorsal aorta, which passes backward through the entire length of the body, supplying the different organs. The most important branches given off are the carotids to the head, the subclavian to the pectoral fins, the mesenteric and cœliac to the digestive organs, the renal to the kidneys, the spermatic or ovarian to the reproductive glands, and the iliac to the pelvic fins. Posteriorly the aorta is continued as the caudal artery. From the anterior part the blood is returned by the jugular vein; from the pectoral fin by the subclavian; from the digestive system by the hepatic-portal to the liver; thence by the hepatic; and from the other portions of the body by the cardinal. All these enter the sinus venosus. Thus in all except the lung-fishes the heart contains only venous blood. All the blood on its course to the system passes through the gills first and is there purified. In the lung-fishes, where the air-bladder functions as a lung, some arterial blood reaches the heart from the air-bladder by the pulmonary vein. This empties into the left side of the sinus venosus. The sinus venosus, the auricle, and the conus are imperfectly divided in the lung-fishes, suggesting the condition in amphibia. The blood-corpuscles of fishes are nucleated.

The *central nervous system* in fishes consists, as in other vertebrates, of a brain and spinal cord and the sympathetic system. The brain presents the usual divisions of the higher forms. It lies in the same plane with the spinal cord, and exhibits no flexures. The brain does not completely fill the cranial cavity, and the intervening space is filled with the gelatinous arachnoid tissue. In the teleosts the optic lobes and the cerebellum constitute the largest divisions, the cerebrum remaining very poorly developed. In the elasmobranchs the olfactory lobes may be enormously developed. Ten cranial and many spinal nerves leave the brain and spinal cord. The sympathetic system presents the usual character and relations found in vertebrates. The emotions of fishes (manifestations of anger, fear, etc.), indicative of the mental status, are extensively considered in the *Proceedings* of the Zoological Society of London for 1878.

Sense Organs. Unequally scattered over the body of fishes there are the so-called 'end buds'—modifications of the epidermis. In structure these sense organs largely resemble taste buds, which in the vertebrates above fishes are restricted to the mouth-cavity. In fishes these 'end buds' are probably also taste organs, since it has been shown that a fish can taste with its skin. Besides these there are other aggregations of sense cells, probably tactile in function. Situated within longitudinal grooves or pits are sense cells, probably largely tactile in function, known as the lateral-line organs. These grooves open by definite pores to the surface. There is usually one series of such along each side, known as the 'lateral line,' but there may also be developed a more or less complicated system of grooves on the head. Many fishes have filamentous appendages, more or less definitely arranged around the mouth and nose, known as barbels. Cave-dwelling fishes, which have lost their power of sight, have strongly developed tactile papillæ on the head. The organs of smell are a pair of pits in the skin at the anterior dorsum of the head, lined with sense cells. There are no internal nares except in the Dipnoi, but the pits open to the surface by the external nares, each more or less completely divided into two, to permit the water to enter one, bathe the sense surface, and escape by the other. Fishes have no external and middle ear, but merely the inner, consisting of the semicircular canals, with their ampullæ, a sacculus, and utriculus. The otoliths are large. Various experiments point to the conclusion that the ear in fishes is merely an organ of equilibrium. The eyes have the usual structure of the vertebrate eye. The accessory organs, like the lids and lachrymal glands, are poorly developed. Eyes may be absent in cave and deep-sea forms. See Nervous System, Evolution of.

The *digestive system* consists, as in other vertebrates, of the alimentary canal, with its more or less definitely marked divisions (mouth, pharynx, gullet, stomach, and intestine), and its glands, liver, gall-bladder, and the pancreas. The mouth and its teeth present the greatest variety in form and arrangement. The pharynx opens to the surface by the gill-clefts as above indicated. The gullet and stomach vary with the food habits of the fish. Predatory fishes swallow and stow away large objects. An extreme instance is the deep-sea fish Chiasmodon niger, which has been taken with a fish in its distensible stomach larger than itself. At the junction of the stomach and intestine, in ganoids and in nearly all teleosts, are given off a number of blind sacs, the pyloric-cæca. These may be very numerous. The intestine in all fishes except teleosts has a spiral valve in the form of a ridge running spirally along the wall and projecting into the interior of the intestine. The alimentary canal opens either with the urino-genital ducts into a common chamber, the cloaca, or, as in teleosts, ganoids, and Dipnoi, separately to the exterior. There are no salivary glands. See Alimentary System, Evolution of.

The *excretory organs* in all fishes are a pair of glands situated just under the backbone and protruding into the body-cavity. The excretion is carried away by a ureter, which empties variously in the different groups of fishes. In the elasmobranchs and Dipnoi the kidneys extend for about two-thirds the length of the body-cavity, and the ureters, having united, open into the cloaca as a common duct. In the teleosts and ganoids the glands may occupy the entire length of the body-cavity. The ureters open into a urinary bladder, and this into the urino-genital sinus, the latter opening separately to the exterior. See Excretory System, Comparative Anatomy of.

Reproduction. The sexes are separate. The testes and ovaries are paired organs varying in shape and position in the abdominal cavity with the different groups. The products of the male and those of the female may or may not be led to the exterior by a duct. In the male this may be a more or less convoluted vas deferens or a simple continuation of a bag. In teleosts the testes or ovaries are simply continued posteriorly as a duct which empties into the urino-genital sinus. In case there is no oviduct the eggs break free into the body-cavity and pass into the urino-genital sinus by a pair of slits in the anterior wall. In ganoids there is always an oviduct. In the elasmobranchs and Holocephali there is an oviduct, usually quite highly developed, opening into the cloaca. In many teleosts and in nearly all elasmobranchs and Holocephali the eggs are fertilized in the body of the mother. In many instances the egg develops there to quite an advanced stage. In all other fishes the milt is poured over the eggs as they are extruded, or into the water in the immediate vicinity. In elasmobranchs and Holocephali the 'claspers' act as intromittent organs, by which the milt is introduced into the body of the female. In the ovoviviparous teleosts the anterior portion of the anal fin is modified into an intromittent organ.

Breeding Habits. Fishes that lay eggs show no parental care, as a rule, either for their eggs or young. The eggs are fastened to rocks or weeds or other objects, and the eggs and young are left to shift for themselves. In many marine species the eggs are extruded into the water, and during their first period of development float at the surface and are carried about by the currents. In all such cases the loss both of eggs and young must be very great, and to meet this loss such species usually produce enormous numbers of eggs. Thus a single large cod may produce in a single year 10,000,000 eggs. On the other hand, in some species there is considerable care bestowed upon the eggs and young by the parents —this duty usually falling to the male. The sticklebacks (q.v.) are well-known instances. The male builds a nest of sticks, grass, etc., cementing them together with a sticky excretion, and guards the nest and eggs during incubation. In some of the Siluridæ, after the young are ready to leave the nest, the male may be seen leading the brood about, guarding it until the individuals are better able to shift for themselves. This instinct is found in other families. The cave blindfish (Amblyopsis) retains the eggs during incubation in its capacious gill-cavity. The seahorse develops a brood-pouch along the ventral side of the body, in which the eggs and young are harbored. Many marine fishes, like the shad and the salmon, ascend the rivers each season to spawn. These migrations may be for great distances, and against the greatest difficulties, such as rapids and falls. Such migratory species are known as anadromous fishes. The reverse process takes place in the case of the eel, which goes to the ocean to spawn.

The *spawning season* of most species is during the spring months. In the tropics, where the rainy and dry seasons alternate, these are determining factors in the time of spawning of certain species. Many species spawn during the colder months, for example the Salmonidæ. Many fishes show on the approach of the breeding season a noticeable sexual difference, the male being marked by more brilliant colors, or by the temporary growth of tubercles on the head and other portions of the body. Many species, however, do not exhibit this sexual dimorphism.

The eggs of fishes vary greatly in size and shape. The typical fish-egg is globular, more or less transparent, having a tough protective membrane, within which the yolk-laden egg proper lies. The yolk is present in sufficient amount to maintain the embryo until it can swim about and feed for itself. The outer protective membrane is very commonly sticky, to enable it to cling to stones, weeds, etc. Sometimes eggs stick together in clusters. In other cases the outer coat has tufts of fine filaments with which the egg fastens itself to weeds. The shark's eggs are inclosed in large, horny, purse-shaped cases within which the embryo is developed. The period of incubation is very various. In certain pelagic eggs the embryo emerges from the eggs in 24 to 48 hours after deposit, while in other cases, as the trout, the period extends over three to six months. See EGG; EMBRYOLOGY.

FOOD. The food of fishes includes all sorts of vegetable and animal matter and forms. Some are omnivorous. Others are exceedingly choice about their food, living almost exclusively upon certain species of crustacea, for instance. Some, like the carp, are vegetarians, and the smaller fishes are the principal food of the larger, predaceous forms, like the trout and bluefish. Many species subsist entirely upon the minute organisms they can strain out of the water.

DISTRIBUTION IN SPACE AND TIME. About 10,000 species of living fishes are known. In their distribution fishes are almost coextensive with water. The greatest variety is found in the tropics. Many families are exclusively marine, others as exclusively of the fresh water, while many have representatives in both, or spend a portion of their time in each. Certain groups, like the Cyprinodontinæ, are distributed only along the shallow shore waters; others, like the sharks and bluefish, are pelagic, living on the high seas, and such usually have a wide distribution. The ocean depths have their peculiar fish fauna—species modified for these peculiar conditions, and unable to subsist at the surface. These species, living in darkness, often have no eyes, and many are phosphorescent. The coldest latitudes harbor their fishes. Some families, like the cod, are prevailingly distributed in colder waters, and certain species have been taken in lakes above the line of perpetual snow. Temperature is one of the important factors in determining the distribution of fishes. Deep-sea forms, where the temperature is uniform, have a wide distribution. The geological history of any region, with the changes in the river systems, etc., it has brought about, is another important factor. See DEEP-SEA EXPLORATION; DISTRIBUTION OF ANIMALS; CAVE ANIMALS; EVOLUTION.

ANCESTRY. The medium in which fishes live and the hard and almost indestructible nature of some portions of their skeleton, as their teeth, spines, and scales, would lead us to anticipate their frequent occurrence in the sedimentary rocks; but inasmuch as the soft parts of the animal are liable to speedy decomposition, the remains of fish must often exist in a fragmentary and scattered condition. Thus the teeth in the shark, the spine defense in the stingray, and the scales in the bony pike would survive the total destruction of the cartilaginous skeleton as well as the soft portions. Many quite complete casts of skeletons, however, have been obtained, so that not a little is known of the past history of the group. The earliest fishes occurred in the Upper Silurian. Remains of all of the main groups, excepting the higher teleosts, have been found from this period. Among the elasmobranchs the earlier forms were quite distinct from any now living, with the possible exception of the Port Jackson shark (q.v.). These forms flourished to the Triassic period, and in the case of the cestracionts to the Eocene. The recent elasmobranchs appeared in the late Triassic or early Jurassic, and were more abundant in the past than at present. The Dipnoi flourished in the Triassic. The ganoids were a dominant group up to Miocene times, but at present exist in mere remnants. The dominant fishes of to-day, namely, the higher teleosts, first appeared in numbers during the Jurassic and Cretaceous periods. These at the present day exhibit the greatest diversity in type. In times past the other groups presented this great variety of form, and it is mainly those species that retained the more generalized characters that survived and are present with us now. See EXTINCTION OF SPECIES.

ECONOMIC VALUE. By far the most important use of fishes to man is in supplying him with food, and in some regions they form the principal means of subsistence. Some fishes, nevertheless, are unpalatable, and even poisonous to a greater or smaller extent. The skin of some cartilaginous fishes yields shagreen, and the air-bladder of some species yields isinglass. The minute laminæ which give brilliancy of color to some, and the similar substance found in the air-bladder of others, afford the materials of which artificial pearls are made. Oil useful for lamps, etc., is obtained from several species, and the medicinal value of cod-liver oil is now well known. See FISHERIES.

CLASSIFICATION. *History of Ichthyology.*—Among the ancient students of ichthyology, that branch of natural history which treats of fishes, the first to be mentioned, as usual, is Aristotle. In modern times ichthyology began to be cultivated about the middle of the sixteenth century by Belon, Rondelet, and Salviani. Their work was of value locally only. The first work of real value, and which marks the beginning of a system based on scientific principles, was that of Willughby and Ray, which appeared in 1686 under the title *Historia Piscium.* Here a distinct effort at classification was made. They divided all fishes into two classes, Cartilaginei and Ossei. Each of these classes was divided into two groups, on the basis of the form of the body—the Cartilaginei into Longi, including the sharks, and Lati, including the skates; and the Ossei into Plani, including the flatfishes, and Non-plani, including all others. It is at once evident how artificial this classification is. Artedi, whose writings, on account of his death, were published by Linnæus, worked out a system of classification considerably influenced by Willughby and Ray. He included the cetaceans among the fishes. His system was adopted by Linnæus in his earlier editions of *Systema Natura*, but later (1758) Linnæus devised an original classification, which, among other changes, eliminated the Cetacea from the fishes and placed them with the mammals. The classification worked out by Bloch and Schneider was superficial in the extreme. The number of fins present was the basis of their division into Monopterygia, Dipterygia, etc. This work was published in 1801. Bloch, in 1782-95, published a large and important work on fishes, comprising nine volumes with fine illustrated plates, in which he described about four hundred species. Several other authors wrote extensively on fishes during the last half of the eighteenth century and the beginning of the nineteenth. Among these is to be mentioned Lacépède, *Histoire naturelle des poissons* (5 vols., Paris, 1803), in which 1400 species were described. During the first quarter of the nineteenth century Cuvier did much on the classification of fishes, his system appearing in his *Regne Animal* (Bonn, 1830). The anatomist Johannes Müller published in 1846 a natural classification which influenced the systems to a very high degree. He divided fishes into Leptocardii, Marsipobranchii, Elasmobranchii, Ganoidea, Teleostei, and Dipnoi. Louis Agassiz (q.v.) advanced our knowledge both of living and fossil fishes. Influenced by the latter, he divided the class into four groups on the character of their scales: placoid, ganoid, cycloid, and ctenoid. This classification, though convenient in many ways for the study of fossil remains, does not have much to commend it, and was adopted by scarcely any of the authorities. Albert Günther, in his *Catalogue of Fishes in . . . the British Museum* (London, 1859-70), has largely modeled the modern system of classification. This work, in 8 vols., appeared between 1859 and 1870. Among the recent more influential American ichthyologists are Theodore Gill, David S. Jordan, and the late E. D. Cope.

PRESENT ARRANGEMENT. The subphylum Vertebrata includes as the lowest in rank of its groups several series of fish-like vertebrates, divisible first into Acraniata (the lancelets [Leptocardii] only; see AMPHIOXUS), and Craniata, which includes all the remainder. The fish-like Craniata fall into two classes:

I. CYCLOSTOMATA. Characterized chiefly by having 'a suctorial mouth devoid of functional jaws,' and by the absence of paired fins; these are the lampreys and hagfishes (orders Petromyzontes and Myxinoidei).

II. PISCES. Characterized by having the organs of respiration (gills) and the organs of locomotion (paired fins) adapted for an aquatic life. The class is divided into subclasses, as follows:

(1) *Elasmobranchii.*—Pisces with a skeleton composed essentially of cartilage—the sharks, rays, etc., divided into three orders, Cladoselachea, Pleuracanthea, Acanthodea, and Selachii. The first three are represented by Paleozoic fossil forms. The last includes many extinct and all the existing forms.

(2) *Holocephali.*—Shark-like Pisces, with a large compressed head and a single external branchial aperture. It includes only the family Chimæridæ (chimæras).

(3) *Teleostomi.*—Pisces 'distinguished from the Elasmobranchii and Holocephali by having the primary skull and shoulder-girdle complicated by the addition of membrane bones, and by possessing bony instead of horn-like fin rays.' This includes all of the common 'bony fishes,' as well as the so-called ganoid fishes. Its orders are: Crossopterygii (bichir, etc.); Chondrostei (sturgeons); Holostei (gar-pikes, etc.); Teleostei (bony fishes generally). The first three orders are frequently grouped together as 'Ganoidei.'

(4) *Dipnoi.*—Pisces with lung-like respiratory organs as well as gills, and the fins constructed on the type of the archipterygium. It includes the lung-fishes, and by some authors is made a separate class altogether. Its orders are Monopneumona and Dipneumona.

(5) *Ostracodermi* (q.v.).—A group of uncertain limits and affinities, known only from Paleozoic fossils, "characterized by the extraordinary development of the exoskeleton (bony plates) of the head, and the absence, in all the fossil remains hitherto found, of endoskeleton, including jaws."

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FISH AS FOOD. Fish is almost universally recognized as one of the important food materials, and enters into the diet of very many if not most American families. From recent data collected by the United States Fish Commission it appears that the total weight of the fish marketed yearly in the United States is 1,696,000,000 pounds, having a value of $47,200,000. By the processes of canning, salting, smoking, and otherwise preserving, the value of the fish is very much increased. In addition, thousands of pounds of fish are annually caught by sportsmen, but statistics of the amount are not available. Of the very large quantity of fish annually placed on the American market the greater part is consumed at home, although a portion is prepared in various ways for export. The preference for fresh-water or salt-water fish is a matter of individual taste. Both are, so far as known, equally wholesome. The market value of fish is affected by various conditions. Among these are the locality from which they come, the season in which they are taken, and the food on which they have grown.

Fish are sold either dressed or round, i.e. whole. Sometimes only the entrails are removed. Often, however, especially when dressed for cooking, the head, fins, and, less frequently, the bones, are removed. This entails a considerable loss in weight as well as of nutritive material. It has been stated on good authority that in dressing fish the following percentages are lost: Large-mouthed black bass, sea-bass, cisco, kingfish, mullet, white perch, pickerel, pike, tomcod, weakfish, and whitefish, each, 17½ per cent.; small-mouthed black bass, eel, Spanish mackerel, porgy, and turbot, each, 13½ per cent.; butter-fish, 12½ per cent.; shad, 11 per cent., and brook-trout, 16½ per cent. More recent figures for loss in weight in dressing are as follows: Bullhead, 50 per cent.; buffalo-fish and lake sturgeon, 40 per cent.; carp and sucker, 35 per cent.; fresh-water sheepshead, 23 per cent.; grass pike, black bass, white bass, yellow perch, and salmon, 15 per cent.; and eels, 10 per cent.

Fresh-water and salt-water fish alike are offered for sale as taken from the water, or preserved in various ways. Large quantities of fish are dried, salted, and smoked, the processes being employed alone or in combination. These methods insure preservation, but modify the flavor. Several fish products are also prepared by these processes. For example, caviar, prepared very largely in Russia, and now made to a large extent also in the United States, is usually prepared from sturgeon-roe by salting. The methods of salting and packing vary somewhat and give rise to a number of varieties.

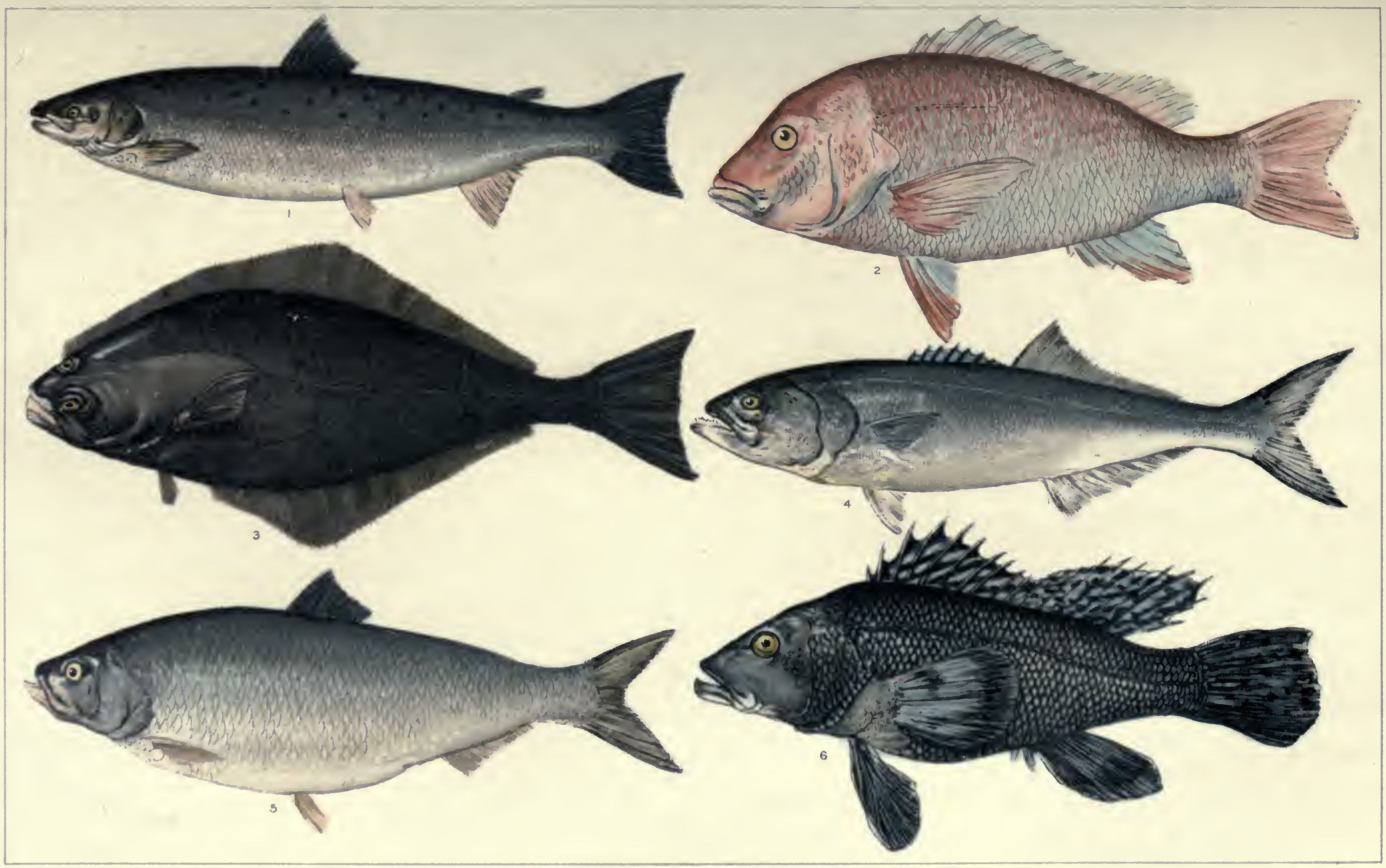
When fish is salted or otherwise cured there is a considerable loss in weight due to removal of the entrails, drying, etc. Codfish loses 60 per cent. in preparation for market. If the market-dried fish be boned, there is a further loss of 20 per cent. The loss in weight of pollack is 60 per cent.; haddock, 62 per cent.; hake, 56 per cent.; and cusk, 51 per cent. The canning industry has been enormously developed in recent years, and thousands of pounds of fish, oysters, clams, lobsters, shrimps, etc., are annually preserved in this way. Various kinds of fish extract, clam-juice, etc., are offered for sale. There are also a number of fish pastes—anchovy paste, for instance—and similar products which are used as relishes or condiments. Preservatives such as salicylate of soda are employed to some extent with fish, and especially oysters, for shipping. The extended use of such materials is not desirable, since some of them are justly regarded as harmful.

Oysters and other shellfish are placed on the market alive in the shell, or are removed from the shell and kept in good condition by chilling or other means. In the shell oysters are usually transported in barrels or sacks. Shipment is made to far inland points in refrigerator cars, and to Europe in cold-storage chambers of vessels. Oysters are often sold as they are taken from the salt water. However, the practice of 'freshening,' 'fattening,' or 'floating' is very widespread—that is, oysters are placed in fresh or brackish water for a short period, in which they become plump in appearance, owing chiefly to the water taken up by their tissues. They have a different flavor from those taken directly from salt water. Lobsters, crabs, and other crustacea, though sometimes boiled before being marketed, are usually sold alive. Turtle and terrapin are usually marketed alive. Turtle soup, however, is canned in large quantities. Frogs, valued for their hind legs, are marketed alive or dressed in all seasons, but are in the best condition in fall or winter.

The average composition of the principal fish, crustacea, etc., used for food is shown in the table below. That of others less frequently eaten is similar.

Fish usually contains less fat than is found in meat. There is, however, much difference in the fat content of the various kinds of fish. They may, indeed, be roughly divided into three classes: The first class would include those containing over 5 per cent. fat; the second those containing between 2 and 5 per cent.; and the third those containing less than 2 per cent. The first group would include such fish as salmon, shad, herring, Spanish mackerel, and butter-fish; the second, whitefish, mackerel, mullet, halibut, and porgy; the third, smelt, black bass, bluefish, white perch, weakfish, brook-trout, hake, flounder, yellow perch, pike, pickerel, sea-bass, cod, and haddock.

AMERICAN FOOD FISHES



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1 SALMON	$1/10$ NATURAL SIZE	–	SALMO SALAR
2 RED SNAPPER	$1/5$ „ „	–	NEOMÆNIS AYA
3 HALIBUT	$1/12$ „ „	–	HIPPOGLOSSUS VULGARIS
4 BLUE FISH	$1/5$ NATURAL SIZE	–	POMATOMUS SALTATRIX
5 SHAD	$1/5$ „ „	–	CLUPEA SAPIDISSIMA
6 BLACK FISH	$1/4$ „ „	–	TAUTOGA ONITIS

Composition of Fish, Mollusks, Crustaceans, etc., Considered as Food.

KIND OF FOOD MATERIAL	Refuse (bone, skin, etc.)	Salt	Water	Protein	Fat	Carbo-hydrates	Mineral matter	Fuel value per pound
Fresh Fish	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Alewife, whole	49.5		37.5	9.7	2.5		0.8	285
Bass, large-mouthed black, dressed	46.7		41.9	10.3	.5		.6	215
Bass, small-mouthed black, dressed	46.4		40.1	11.5	1.3		.7	270
Bass, sea, dressed	46.8		42.2	10.1	.2		.7	195
Bluefish, dressed	48.6		40.3	9.8	.6		.7	205
Butterfish, dressed	34.6		45.8	11.7	7.2		.7	520
Cod, dressed	29.9		58.5	10.6	.2		.8	205
Cod, steaks	9.2		72.4	16.9	.5		1	335
Cusk, dressed	40.3		49	10.1	.1		.5	190
Eel, salt-water, dressed	20.2		57.2	14.6	7.2		.8	575
Flounder, common, dressed	57		35.8	6.3	.3		.6	130
Hake, dressed	52.5		39.5	7.2	.3		.5	145
Haddock, dressed	51		40	8.2	.2		.6	160
Halibut, dressed	17.7		61.9	15.1	4.4		.9	465
Herring, whole	46		37.3	10	5.9		.8	435
Mackerel, dressed	40.7		43.7	11.4	3.5		.7	360
Mackerel, Spanish, dressed	24.4		51.4	15.8	7.2		1.2	595
Mullet, dressed	49		38.2	9.8	2.4		.6	285
Perch, white, dressed	54.6		34.4	8.7	1.8		.5	235
Perch, yellow, dressed	35.1		50.7	12.6	.7		.9	265
Pickerel, dressed	35.9		51.1	11.9	.2		.9	230
Pike, dressed	30.5		55.4	13	.4		.7	260
Pollack, dressed	28.5		54.3	15.5	.6		1.1	315
Pompano, dressed	45.5		39.5	10.2	4.3		.5	370
Red snapper, dressed	48.9		40.3	9.6	.6		.6	205
Salmon, California (sections)	5.2		60.3	16.5	17		1	1,025
Salmon, Maine, dressed	23.8		51.2	14.6	9.5		.9	675
Shad, dressed	43.9		39.6	10.3	5.4		.8	420
Shad, roe			71.2	23.4	3.8		1.6	595
Smelt, whole	41.9		46.1	10	1		1	230
Sturgeon, dressed	14.4		67.4	15.4	1.6		1.2	355
Tomcod, dressed	51.4		39.6	8.2	.3		.5	165
Trout, brook, dressed	37.9		48.4	11.7	1.3		.7	275
Trout, brook, whole	48.1		40.4	9.8	1.1		.6	230
Trout, lake, dressed	35.2		45	12.4	6.6		.8	510
Turbot, dressed	39.5		43.1	7.9	8.7		.8	515
Weakfish, dressed	41.7		46.1	10.2	1.3		.7	245
Whitefish, whole	53.5		32.5	10.3	3		.7	320
General average of fresh fish as sold	42		44	10.5	2.5		1	300
Preserved Fish								
Mackerel, "No. 1," salted	33.3	7.1	28.1	14.7	15.1		1.7	910
Cod, salted and dried	24.9	17.2	40.3	16	.4		1.2	315
Cod, "boneless codfish," salted and dried		21.5	54.4	22.1	.3		1.7	425
Caviar			38.1	30	19.7	7.6	a4.6	1,530
Herring, salted, smoked, and dried	44.4	6.5	19.2	20.2	8.8		.9	45
Haddock, "findon haddie," salted, smoked, and dried	32.2	1.4	49.2	16.1	.1		1	305
Halibut, salted, smoked, and dried	6.9	12.1	46	19.1	14		1.9	945
Sardine, canned	5		53.6	24	12.1		5.3	955
Salmon, canned	3.9	1	59.3	19.3	15.3		1.2	1,005
Mackerel, canned		1.9	68.2	19.9	8.7		1.3	735
Mackerel, salt, canned	19.7	8.3	34.8	13.8	21.3		2.1	1,155
Tunny (horse-mackerel), canned			72.7	21.5	4.1		1.7	575
Haddock, smoked, canned		5.6	68.7	21.8	2.3		1.6	565
Mollusks								
Oysters, solid			88.3	6.1	1.4	3.3	.9	235
Oysters, in shell	82.3		15.4	1.1	.2	.6	.4	40
Oysters, canned			85.3	7.4	2.1	3.9	1.3	300
Scallops			80.3	14.7	.2	3.4	1.4	345
Long clams, in shell	43.6		48.4	4.8	.6	1.1	1.5	135
Long clams, canned			84.5	9	1.3	2.9	2.3	275
Round clams, removed from shell			80.8	10.6	1.1	5.2	2.3	340
Round clams, canned			83	10.4	.8	3	2.8	285
Mussels	49.3		42.7	4.4	.5	2.1	1	140
General average of mollusks (exclusive of canned)	60.2		34	3.2	.4	1.3	.9	100
Crustaceans								
Lobster, in shell	62.1		31.1	5.5	.7		.6	130
Lobster, canned			77.8	18.1	1.1	.6	2.4	395
Crawfish, in shell	87.7		10	2	.1	.1	.1	45
Crab, in shell	55.8		34.1	7.3	.9	.5	1.4	185
Crab, canned			80	15.8	1.5	.8	1.9	370
Shrimp, canned			70.8	25.4	1	.2	2.6	520
General average of crustaceans (exclusive of canned)	73.7		20.7	4.3	.4	.2	.5	100
Terrapin, Turtle, etc.								
Terrapin, in shell	79		15.6	4.5	.7		.2	115
Green turtle, in shell	76		19.1	4.5	.1		.3	90
Average of turtle and terrapin	77.5		17.4	4.2	.7		.2	105
Frogs' legs	32		57	10.2	.1		.7	210
General average of fish, mollusks, crustaceans, etc	44		42.5	10	2.5	.1	.9	295

a. Including added salt.

When judged by its composition, the place of fish in the diet is the same as that of meat; that is, it is supplementary to cereals and other vegetables, most of which, as wheat, rye, maize, rice, potatoes, etc., are rich in carbohydrates, which are not present in appreciable amounts in the flesh of fish. Preserved fish, as a rule, show a small percentage of refuse, with the exception of a few kinds which are preserved whole. The percentage of actual nutrients is much larger than in the corresponding fresh fish, owing to the removal of a large part of the refuse and more or less water. The gain in nutrients is mostly represented by protein, which is the most valuable nutrient. Canned fish, which is in effect cooked fish, compares favorably as regards composition with the fresh material. Generally speaking, the amount of refuse is small, since the portions commonly rejected in preparation for the table have been removed before canning. Shellfish resemble meat and food fishes in general composition. They contain, however, an appreciable amount of carbohydrates. Judging by the relative amount consumed, oysters are the most important of the shellfish. Speaking roughly, a quart of oysters contains on an average about the same quantity of actual nutritive substances as a quart of milk, or three-fourths of a pound of beef, or two pounds of fresh codfish, or a pound of bread.

A number of experiments have been made with man to learn how thoroughly fish is digested and to compare it in this respect with other foods. It has been found that fish and lean beef are about equally digestible. In each case about 95 per cent. of the total dry matter, 97 per cent. of the protein, and about 95 per cent. of the fat were retained by the body. Other experiments of the same character indicate that salt fish is less thoroughly digested than fresh fish. The nutritive value of shellfish, as of other fish, depends to a considerable extent upon their digestibility; but so little is known upon this point that nothing more can be said with certainty here than that oysters belong to the more easily digestible class of foods. So far as can be learned no experiments have been made which show how thoroughly crabs, clams, and other crustacea, turtle and terrapin, and frogs' legs are digested. Inspection of a considerable number of dietary studies of families of farmers, mechanics, professional men, and others, carried on in different regions of the United States, shows that out of the 20 per cent. of the total food and the 43 per cent. of the total protein obtained from animal sources, only about 2 per cent. of the total food and 4 per cent. of the total protein is furnished by fish, shellfish, etc., showing to what a limited extent this valuable food is used in the average household. It is not improbable that in communities where fishing constitutes the principal industry much larger quantities are consumed. It has been found that the laborers employed in the fisheries of Russia consume from 26 to 62 ounces of fish daily. This, with some bread, millet meal, and tea, constitutes their diet throughout the fishing season. These quantities are unusually large, but no bad effects are mentioned as following the diet.

There is a widespread notion that fish contains large proportions of phosphorus, and on that account is particularly valuable as brain-food. The percentages of phosphorus in specimens thus far analyzed are not larger than are found in the flesh of other animals used for food. But even so, there is no experimental evidence to warrant the assumption that fish is more valuable than meats or other food material for the nourishment of the brain. The opinion of eminent physiologists is that phosphorus is no more essential to the brain than nitrogen, potassium, or any other element which occurs in its tissues. The value commonly attributed to the phosphorus is based on a popular misconception of statements by one of the early writers on such topics. It should be stated that most physiologists regard fish as a particularly desirable food for persons of sedentary habits, since it is easily digested and not too hearty. While, so far as can be learned, such statements do not depend upon experimental evidence, they are thought to embody the result of experience.

In cooking, fish may be boiled, steamed, broiled, fried, baked, or combined with other materials in some made dish. When boiled, it is stated that the loss in weight ranges from 5 to 30 per cent., a loss that consists largely of water—that is, the cooked fish is less moist than the raw. Little fat or protein is lost. So far as known, experiments have not been made which show the losses by other methods of cooking. It is, however, probable that there would be usually a very considerable loss of water.

In view of statements of a popular nature which have been made on the dangers from eating poisonous fish or from ptomaines contained in fish, a few words summarizing the actual knowledge on these topics seem desirable. There are several species of fish which are actually poisonous. Few of them, however, are found in the United States, and the chances of their being offered for sale are very small. Such fish are mostly confined to tropical waters. Fish may contain parasites, some of which are injurious to man. These are, however, destroyed by the thorough cooking to which fish is usually subjected. Occasionally cases of ptomaine poisoning have been traced to eating fish or fish products. Fish which has been frozen and, after thawing, kept for a time before it is cooked is especially likely to contain injurious ptomaines. Canned fish should never be allowed to remain long in the can after opening, but should be used at once. There is some possibility of danger from the combined action of the can contents and oxygen of the air upon the lead of the solder or the can itself. Furthermore, canned fish seems peculiarly suited to the growth of micro-organisms when exposed to the air. Finally, fish offered for sale should be handled in a cleanly manner and stored and exposed for sale under hygienic conditions. Oysters when 'floated' or 'fattened' should never be placed in water contaminated by sewage. Severe illness and death have resulted in a number of cases from eating raw oysters contaminated with sewage containing typhoid-fever germs.

For further information, consult the authorities referred to under FOOD; also Atwater, "The Chemical Composition and Nutritive Value of American Food Fishes and Invertebrates." *Report of Commissioner of Fish and Fisheries, 1883* (Washington, 1885); *United States Department of Agriculture, Office of Experiment Stations,* *Bulletin 28* (revised); Langworthy, "Fish as Food," in id., *Farmers' Bulletin 85* (Washington, 1899).

FISH, ROYAL. Certain 'great fish,' as the whale and sturgeon, which by English law are the property of the Crown, when either thrown on shore or caught near the coast. "Our ancestors," says Blackstone, "seem to have entertained a very high notion of the importance of this right, it being the prerogative of the Kings of Denmark, and the Dukes of Normandy; and from one of these it was probably derived to our princes. It is expressly claimed and allowed in the statute *De Prærogativa Regis* (17 Edw. II., c. 11), and the most ancient treatises of law now extant make mention of it." Strictly, it was the head only of the whale which belonged to the King, the tail being a perquisite of the Queen Consort. In Scotland whales thrown on shore above six horse-power draught belong to the Queen or the Admiral. See GAME LAWS.

FISH, HAMILTON (1808-93). An American statesman. He was born in New York City, graduated at Columbia College in 1827, studied law, and was admitted to the bar in 1830. In 1842 he was elected to Congress as a Whig. In 1846 he was the Whig nominee for Lieutenant-Governor on the same ticket with John Young for Governor. During the campaign Fish antagonized the 'anti-renters' (see ANTI-RENTISM), with the result that, although the Whig ticket was generally successful, he himself was defeated. In the year following, however, on the appointment of his successful Democratic competitor, Addison Gardiner, as a judge of the State Court of Appeals, a special election was held to fill the vacancy, at which Fish was elected. In 1848 he was nominated by the Whigs for Governor, and the result was a sweeping victory for Fish. In 1851 he was elected United States Senator to succeed Daniel S. Dickinson. The years 1857-60 he spent in Europe, returning in the latter year to take an active part in the campaign in behalf of the Lincoln ticket. Early in 1862 he was appointed, with Bishop Ames, a commissioner to proceed to Richmond and other Southern cities within the Confederate lines to relieve Federal prisoners; and although the Confederate authorities refused to allow them to proceed, the negotiations that followed resulted in an arrangement for the exchange of prisoners that was continued throughout the Civil War. In March, 1869, Fish was appointed Secretary of State, and served through both of Grant's administrations, retiring in 1877. In 1871 he was one of the commissioners who negotiated and signed the Treaty of Washington with Great Britain. During the 'Alabama Claims' arbitration he was successful in securing the adoption by the tribunal of a provision which relieved the United States from responsibility for indirect damages arising out of the Fenian raids and Cuban filibustering expeditions. He also brought about the settlement of the longstanding Northwestern boundary dispute with Great Britain, which resulted in the cession to the United States of the island of San Juan (see SAN JUAN BOUNDARY), and the satisfactory settlement of the complications growing out of the *Virginius* affair (q.v.). Under his direction, also, extensive reforms were undertaken in the consular service, by which civil-service examinations were required of candidates.

FISH, HAMILTON, Jr. (1849—). An American lawyer and politician, born in Albany, N. Y., the son of Hamilton Fish. He was educated at Columbia College, acted as private secretary to his father, and after his graduation at Columbia Law School (1873) was aide-de-camp to Governor Dix; he was Republican leader in the Assembly in 1890, and its Speaker in 1895. After the death of his wife he lived abroad for several years, and, on his return to this country, at Garrison, N. Y.

FISH, NICHOLAS (1758-1833). An American Revolutionary soldier. He was born in New York City, and began the academic course at Princeton, but left before graduating to pursue the study of law in the office of John Morin Scott in New York. There he became actively interested in the organization of the Sons of Liberty (q.v.), and in 1776 was appointed by Scott, who had been commissioned brigadier-general, as aide-de-camp on his staff. At the close of the Revolutionary War he held the rank of lieutenant-colonel. He was a division inspector under Steuben in 1778, and ably seconded that officer in his attempts to drill and discipline the Continental troops. He participated in the battles of Saratoga and Monmouth, in Sullivan's expedition against the Indians in 1779, and in the Virginia and Yorktown campaigns, in which he served for a time on the staff of Lafayette. In 1786 he was appointed Adjutant-General of New York State, which position he held for many years. In 1794 he was appointed by Washington supervisor of the Federal revenue in New York City. In 1811 he was the Federalist candidate for Lieutenant-Governor of the State, and carried New York City by a large majority. During the War of 1812 he served as a member of the City Committee of Defense.

FISH, NICHOLAS (1846-1902). An American diplomatist, grandson of Col. Nicholas Fish, and son of the Secretary of State, Hamilton Fish (q.v.). Born in New York, and educated at Columbia and at Harvard Law School, he practiced law in New York City and then went into the diplomatic service. Appointed second secretary of legation at Berlin (1871), he became secretary (1874), and acted in the continued absence of his chief as *chargé d'affaires;* held the latter position in Switzerland (1877-81), and then served as Minister to Belgium (1882-86). He returned to New York in 1887, and became a member of the banking firm of Harriman & Co. He was president of the New York branch of the Society of the Cincinnati. He was fatally assaulted in New York City, September 16, 1902.

FISH-CROW. A small crow (*Corvus ossifragus*), common along the eastern coast of the United States, from the Hudson River to Mexico. It is about sixteen inches in length, and the plumage is glossed with violet blue on the back, changing to a more greenish tinge on the head and lower parts. It rarely leaves the coast and margins of tidal rivers—where it feeds on small animals and carrion found on the beaches and mud flats, or dexterously seizes floating morsels—except to make excursions in the spring to neighboring woods and fields in search of birds' nests, of which it is a persistent robber. It ascends the Mississippi and other large rivers long distances. Its flight and cry are easily distinguished from those of the common crow, and it does not form great flocks and move regularly to and from the shore, as does that species. It nests in trees, preferring pines. A similar but somewhat smaller and blacker species (*Corvus minutus*) inhabits Cuba. Compare CROW.

FISH CULTURE, or PISCICULTURE (from Lat. *piscis*, fish + *cultura*, culture, from *colere*, to cultivate). The breeding, rearing, transplanting, and protection of aquatic animals in order to maintain or increase their abundance. Literally the term applies only to the culture of fishes, but it is loosely used to include also such forms as the lobster, oyster, frog, etc.

GENERAL CONSIDERATIONS. The maintenance of artificial ponds for the rearing of fresh-water fishes for food or ornamental purposes is a very ancient practice, and is carried on by nearly every civilized nation. In China fish culture has been extensively practiced from ancient times. In Europe, and particularly in Germany and Sweden, pond culture is of considerable importance. In recent years, however, fish culture has become almost synonymous with the harvesting of eggs, their artificial fecundation, and the rearing of the young up to varying stages in hatcheries established for that purpose. This seems to have been an ancient custom in China, where the Europeans probably got their first ideas of modern pisciculture. Both in Europe and America the industry has become of such importance as to be more or less completely supported by Government funds. In Europe the hatcheries, over four hundred in number, are largely private enterprises, but such are as yet comparatively rare in the United States and Canada. The United States far surpasses all other countries in the extent of this work under Government patronage. The Federal Government supports twenty-eight hatcheries at various favorable places, and one steamer, the *Fishhawk*, a sort of floating hatchery, exclusively used in the actual culture of fishes or in the investigation of problems pertaining thereto. The number of fish handled in 1899, either as eggs, fry, fingerlings, yearlings, or adults, aggregated 1,056,371,898. Of this number 986,000,000 were fry and fingerlings, and 5,000,000 yearlings and adults. Besides these many of the States support hatcheries for the particular fishes of importance in their territories. (See below.) The purpose of the governmental hatcheries is either to stock new waters with desirable species or to maintain by planting the supply in waters already tenanted.

In most species it is impracticable to carry culture much beyond the stage of hatching, or 'fry,' as the hatchings are called. This is true of all the strictly marine forms such as the cod and flat fishes. In many of the fresh-water species, such as the various salmons and sunfishes, they are often nourished and protected in suitable ponds until they have become three or four inches long—'fingerlings,' as they are then called—before planting. They may even be carried for another year and planted as yearlings.

It is now established that waters thus stocked or replenished have not only been able to maintain their supply of fishes, but have greatly increased it. Pacific waters have been successfully stocked with Atlantic species, and almost exhausted streams in various parts of the United States have been successfully restored. In some species the eggs are not handled, but the spawning fishes are provided with favorable ponds for spawning purposes, where their eggs are protected from enemies, given suitable temperature, etc. This is the case with members of the Centrarchidæ, such as the black bass, which build a nest and guard the eggs during incubation. The young when hatched are either taken from the ponds and fed in suitable troughs until better able to shift for themselves, or are supplied with food in the ponds themselves. In most species, however, the eggs are artificially expelled from the body into suitable receptacles, in which they are fertilized by the addition of milt similarly obtained from the males. After a few moments the eggs are transferred to running water, where they are kept and taken care of until the embryos emerge. The exact method employed in fertilization, but especially the subsequent handling of the eggs during incubation, varies considerably with the character of the egg.

TREATMENT OF EGGS. Nearly all fish-eggs are spherical in shape. The true portion, which is heavily charged with yolk, is inclosed by a membrane varying greatly in character. This membrane may be adhesive to any foreign object or to adjoining eggs, or it may be supplied with various modifications of filaments which cause the eggs to become entangled with each other and with foreign objects, such as weeds. These properties necessitate different methods in their handling during incubation. Again, eggs may be pelagic, i.e. buoyant, lighter than the water, or heavy, sinking to the bottom. Some eggs, as those of the whitefish and shad, are only slightly heavier than water, i.e. semi-buoyant.

Pelagic eggs belong to the cod, flatfish, mackerel, tautog, etc. Such eggs are incubated in a way quite different from the heavy eggs; in nature they are extruded in the water and rise to the surface, where they develop. Such eggs usually hatch in a very short time, from a few days to two or three weeks. The apparatus now used for hatching pelagic eggs is the McDonald tidal box. The water enters through the cheesecloth bottom and through a small hole at one end, the latter giving the water and eggs within the box a gentle rotary motion. By means of an automatic siphon the water is also made to rise and fall at short intervals, thus insuring a more perfect renewal of the water.

Heavy eggs, as those of the salmon and trout, are spread out on small wire-bottomed trays. These are placed in tiers in long troughs, into which the water enters at one end and by an arrangement of partitions is made to flow from below upward through the tiers of eggs, thus bathing them, and flowing out at the opposite end of the trough. During development in these trays constant attention is necessary to avoid too strong currents through the troughs, thereby shifting the eggs, and especially to remove the dead eggs, which are attacked by a fungus, and, if allowed to remain, will speedily contaminate the whole lot.

Semi-buoyant eggs, as those of the whitefish, are hatched successfully in the McDonald jar. This has a rounded bottom, and the water is introduced by a glass tube extending through the lid to near the bottom. The water entering slowly keeps the eggs in slow motion, to prevent them from 'banking' or gathering in lumps. The water escapes through the top by a tube or a sort of spout, carrying with it the young as they emerge from the eggs.

Adhesive eggs, like those of the smelt, are first mixed with starch or 'muck,' to deprive them of their glutinous properties, after which they are handled like other heavy or semi-buoyant eggs.

TREATMENT OF FRY. The successful rearing of fry to later stages was for a long time a problem difficult of solution. This has now, however, been perfected with certain species, like the salmon and trout, to a very high degree. The kind and quantity of water and food and the prevention of diseases are the main points to consider. A large quantity of water at a low temperature is one of the essentials to rapid and healthy growth of most species, particularly the salmon and trouts. Limited numbers are put in long rearing troughs—usually the same in which they were hatched—and a large volume of water is introduced in one end. The fry when first hatched have a large yolk-bag which supplies them with food for four or five weeks. About a week before the entire yolk is absorbed they are moved from the trays into rearing troughs. The time to begin feeding them must be ascertained by trial. If hungry they will rise to a minute particle of food thrown on the surface of the water. At first it is essential to feed them at frequent intervals, and the quantity at a given time must be carefully gauged to prevent them from gorging themselves and to prevent any excess of food from decaying in the water. Liver chopped to very fine particles is the food commonly used. Later the amount of care necessary grows less, so that one meal per day suffices. Larvæ of flies and various crustacea are then fed to them, and when the fish reaches a considerable size coarsely chopped-up beef and fish constitute the main food.

Eggs are not equally hardy at all stages of development. At the time when the eyes begin to show their pigment, or the eggs are 'eyed,' they are usually transported. This is done in trays, the eggs being properly covered and surrounded by sphagnum moss and kept at a low temperature. This permits the eggs to be transported for thousands of miles without any serious losses. Temporary hatching troughs are built in places out of the way, yet favorable for collecting eggs. The eggs are carried to the 'eyed' stage, and can then be safely transported to more commodious quarters for further development. The United States Fish Commission owns four cars especially equipped and exclusively used for the transportation of eggs and young fishes. They are supplied with tanks and cans and suitable means for aërating the water and controlling the temperature.

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FISHER, or PENNANT'S MARTEN. The largest (except the wolverine) of the fur-bearing carnivores of the weasel family (Mustelidæ), called in books Pennant's marten (*Mustela Pennanti*). It is found in forested and uncivilized parts of Canada and the Northern United States, where it formerly ranged southward to Tennessee. It is about thirty inches long, besides the tail, which is twelve inches or so more. In color it is chiefly black, often with gray or brown tints toward the head. It is a fierce nocturnal animal, living chiefly on birds and small quadrupeds, and having the general habits of the marten. Its fur in winter is good, and is much used in Europe. The black tail was once a favorite ornament to the caps of the Polish Jews. It is called by the trappers *pekan*, *wejack*, or perhaps more commonly *black-cat*. The name 'fisher' is said to be due to the fondness of the animal for the fish with which early trappers baited their marten-traps, but more probably arose from misunderstanding of its habits, or confusion with the mink. It is a great nuisance to marten-trappers whatever bait they use, but is itself taken without difficulty in large traps baited with meat. Consult Coues, *Fur-bearing Animals* (Washington, 1877).

FISH'ER, CHARLES (1808-80). A Canadian statesman, born in New Brunswick, Canada. In 1837 he entered the Provincial Cabinet. He was a member of the Executive Council from 1848 to 1857, was a commissioner to consolidate and codify the statute law of the province in 1852, and was Attorney-General from 1854 to 1861 and again in 1866. In 1867 he attended the conference of the representatives of British North America in London, which arranged the terms of union.

FISHER, CHARLES (1816-91). A comedian who began his career in England, but after 1852 was connected with the American stage. He was born in Suffolk, of a theatrical family, and made his début in 1844 at the Princess's Theatre, London. He came to this country to join William E. Burton, making his first appearance here as Ferment in *The School of Reform*. His subsequent active life was spent in three companies: with Burton from 1852 to 1861, Wallack from 1861 to 1872, and Daly from 1872 to 1890, when he retired. His most characteristic and noted part was Triplet, in *Masks and Faces*, others of his best being Sir Peter Teazle, Jaques in *As You Like It*, and Graves in *Money*. He was tall and dignified in appearance and an admirable player of old men. He died in New York. Consult Hutton, in *Famous American Actors of To-Day*, ed. by McKay and Wingate (New York, 1896).

FISHER, CLARA (1811-98). A popular actress; after 1834 the wife of the composer J. G. Maeder. She was born in London, July 14, 1811, and first made a sensation on the boards of Drury Lane when she was about six years old (December 10, 1817) as Lord Flimnap, the Prime Minister of Lilliput, and in a part in *Richard III*. After ten years of prosperity in various British theatres, her precocious versatility showing itself even in such an ill-chosen rôle as that of Shylock, she came with her family to America, where she made her appearance late in 1827. Her charms, both as an actress and as a singer, were largely those of manner. Ophelia and Viola were her best Shakespearean parts, and as Lady Teazle she won many successes; but her favorite characters were such as Clari in *The Maid of Milan*, and the Four Mowbrays in *Old and Young*. She died at Metuchen, N. J. Consult: the *Autobiography of Clara Fisher Maeder*, edited by Douglas Taylor (Dunlap Society, New York, 1897); Ireland, in Matthew and Hutton, ed., *Actors and Actresses of Great Britain and the United States* (New York, 1886).

FISHER, George Jackson (1825-93). An American physician, born at North Castle, N. Y., and educated at the New York University Medical School. He was medical attendant at the State prison, Sing Sing, from 1853 to 1854, United States examining physician of the Seventh Brigade, New York State National Guard, from 1853 to 1873, and president of the New York State Medical Society in 1874. He succeeded Dr. Samuel D. Gross as the contributor of a "History of Surgery" to the *International Encyclopædia of Surgery*, and published: *On the Animal Substances Employed as Medicines by the Ancients* (1862); *Diploteratology: an Essay on Compound Human Monsters* (1866); *Are Malformations or Monstrosities of the Fœtus in Utero Ever Produced by the Power of Maternal Emotion?* (1870); *A Brief History of the Discovery of the Circulation of the Blood* (1877); *Teratology* (1875); *Sketches of Some of the Old Masters of Anatomy, Medicine, and Surgery* (1880-83).

FISHER, George Park (1827—). An American Congregational clergyman, distinguished as a scholar and historian. He was born at Wrentham, Mass., graduated from Brown University in 1847, and Andover Theological Seminary in 1851. In 1854 he was appointed professor of divinity and college pastor of Yale College, and held the position till 1861, when he was transferred to the professorship of ecclesiastical history in the Yale Divinity School; in 1901 he became professor emeritus. Dr. Fisher is one of the leading Church historians of the United States. He has published: *Essays on the Supernatural Origin of Christianity* (1865); *Life of Benjamin Silliman* (1866); *History of the Reformation* (1873); *The Beginnings of Christianity* (1877); *Faith and Rationalism* (1879); *Discussions in History and Theology* (1880); *The Christian Religion* (1882); *The Grounds of Theistic and Christian Belief* (1883); *Outlines of Universal History* (1885); *History of the Christian Church* (1888); *Manual of Christian Evidences* (1890); *Nature and Method of Revelation* (1890); *The Colonial Era* (1892); *Manual of Natural Theology* (1893); *History of Christian Doctrine*, in the "International Theological Library" (1896); *Brief History of the Nations* (1890).

FISHER, John (c.1459-1535). An English Churchman. He was born about 1459 at Beverley, Yorkshire, was educated at Michaelhouse, now incorporated with Trinity College, Cambridge, where he took his master's degree in 1491, and became master of the college in 1497. The same year Margaret, Countess of Richmond, mother of Henry VII., made him her chaplain and confessor. In 1501 he was elected vice-chancellor of the university, and in 1503 became the first Lady Margaret professor of divinity. In 1504 he was chosen chancellor of the university, and the same year he was appointed Bishop of Rochester. He labored diligently for the welfare of both the Church and the universities. The Reformation of Luther found in him a strenuous opponent. He refused to declare the marriage between Henry VIII. and Catharine of Aragon—whose confessor he was—illegal, and thereby won the King's hostility. He opposed the suppression of the lesser monasteries in 1529, and the acknowledgment of the King as head of the Church in 1531. He was imprisoned, and refusing to take the oath affirming the legality of Henry's marriage with Anne Boleyn, he was committed to the Tower, February 16, 1534. He was treated with great rigor, and his bishopric was taken from him. While thus situated the Pope, Paul III., as a recognition of faithful services and just merit, sent Fisher a cardinal's hat, in entire ignorance of his rupture with the King. The result was Fisher's complete ruin. He was accused of high treason, and, after a brief trial, was condemned and executed June 27, 1535. Fisher's Latin works were published at Würzburg in 1597; an edition of his English works by J. E. B. Mayor has been begun (vol. i., 1876). Consult his *Life*, by Lewis, edited by Turner (London, 1855), and by Bridgett (London, 1890); also Mason, *Lectures on Colet, Fisher, and More* (London, 1895).

FISHER, John (1569-1641). An English Jesuit and theologian. He was born in Durham, was educated at the English colleges in Rheims and Rome, and entered the priesthood when but twenty-three years old. By 1594 he was a member of the Society of Jesus, and suffered religious persecution in Holland and England. Escaping from prison in his native land, he traveled to its northern parts as a missionary, and enlisted some distinguished proselytes. Again arrested, he was condemned to death, but was banished to Brussels instead, and returned to England to be kept for three years in prison, where he made many converts. He was an able debater with prominent Protestants, and was favored for a time by the Stuarts; but his Order was distrusted, even by other Catholics, and he suffered further banishment, followed by imprisonment on his return. His published writings consist of theological disputations. Consult *Conference Between William Laud, Late Archbishop of Canterbury, and Mr. [John] Fisher, the Jesuit*, edited by Simpkinson (London, 1901).

FISHER, Joshua Francis (1807-73). An American author, born in Philadelphia, Pa. He graduated in 1825 at Harvard, and was admitted to the bar in Philadelphia in 1829, but did not practice. He became an incorporator of the Pennsylvania Institution for the Instruction of the Blind and a student of questions of United States, in particular of Pennsylvania, history. His chief publication was *The Private Life and Domestic Habits of William Penn* (1836). He wrote also an interesting study on *The Degradation of Our Representative System and Its Reform* (1863), and other works.

FISHER, Payne (1616-93). An English poet and political satirist. He was born at Warnford, Dorsetshire, and was educated at Oxford and Cambridge, but went soldiering to Holland in 1638. The following year found him in the English Royalist army, where he afterwards fought under Prince Rupert; but at the defeat of Marston Moor he retired, to join the ranks of needy literary men in London. Turncoat through necessity, he grew in favor with the Parliamentarians, and was Cromwell's poet laureate, writing Latin verse to order, in a highly panegyric style. At the Restoration he merely changed his dedications, but despite the satirical pamphlets he directed against his late patrons, he fell out of favor at Court and died poor. Two prose works which he wrote while in Fleet Prison are of some importance because they describe *Tombs, Monuments, and Sepulchral Inscriptions* which were destroyed in the great fire.

FISHER, Sydney George (1856—). An American lawyer and writer, born in Philadelphia. He graduated at Trinity College in 1879, studied law at the Harvard Law School for two years, and in 1883 was admitted to the bar at Philadelphia. His publications, which are mostly on subjects connected with American history, have attained considerable popularity. They include, in addition to numerous magazine articles: *The Making of Pennsylvania* (1896); *Pennsylvania, Colony and Commonwealth* (1897); *The Evolution of the Constitution of the United States* (1897); *Men, Women, and Manners in Colonial Times* (2 vols., 1898); *The True Benjamin Franklin* (1899); *The True William Penn* (1900); and *The True Story of the Revolutionary War* (1902).

FISHER, William Arms (1861—). An American song-composer, born in San Francisco, Cal. He received his first lesson in music from John P. Morgan, a leading Western musician. Intended for a business career, he was led to devote himself entirely to music, and with that end in view he left California (1890) and went to New York. There he studied counterpoint, canon, and fugue with Horatio Parker, and later, winning a scholarship in the National Conservatory of Music, he was enabled to study composition and orchestration under Anton Dvořák. He was instructor in harmony at the Conservatory of Music for several years, resigning in 1895 to take up teaching in Boston. He is essentially and preëminently a song-composer, and has met with unqualified success in his chosen field.

FISHERIES. The capture of various kinds of fish for the purpose of trade has always been extensively carried on in maritime countries and in those which are watered by large rivers, and has been the means in many instances of adding greatly to their prosperity. The art has been brought only by degrees to its present perfection, but in nothing did primitive man exhibit greater ingenuity and skill than in the taking of fish, and they were effectively preserved, and formed a large element in savage sustenance and barter in all parts of the world. The importance of fisheries in the food-supplies of nations, inland as well as maritime, and as offering a remunerative return for labor, can scarcely be overestimated. One great peculiarity of this source of wealth is that the sea harvest is ripened without trouble or expense for the fisher, who only requires to provide the means of gathering it.

Means of Capture. Lines. The principal means of capturing fishes are nets and the hook and line. The hand-line is much used for ordinary fishing, but where this is carried on extensively at sea, a 'set' or 'long' line must be used. This is known in America as a *trawl*. These set-lines vary with the kind of fishing, but they are all built on the general plan of a long line, to which at intervals shorter lines bearing the hooks are attached. The line is weighted at the ends or at intervals. It may be provided with floats at intermediate distances, so that the hooks near the weights catch bottom fishes and the others those at middle depths. These lines are set in varying lengths, but a well-equipped fishing schooner will operate several miles of trawl, carrying 10,000 to 15,000 hooks. The boats from which so extensive lines are operated are provided with winches to bring up the lines from the great depths.

Hand-lines are such as are manipulated with the hand. They have one or several hooks, and are set, or sometimes are drawn or 'trolled' through the water from a boat. The black bass, bluefish, pickerel (qq.v.), and other predaceous species are taken by this method.

Nets and Weirs. The principal nets are the beam-trawl, the gill-net, and seine. In America the 'long line' is known as a trawl, but in England this term refers to a large, purse-shaped net attached to a front beam, which is weighted and dragged at varying depths near or along the bottom for bottom fishes, such as soles and flounders. This is one of the principal methods of fishing in the British waters. Trawls are often of great size, 75 to 100 feet in length, and are used at great depths, requiring vessels of considerable strength. Gill-nets or drift-nets are extensively used both in the seas and in inland waters, since they are suitable to any water of sufficient depth to float them properly. They are set or drifted across channels or across the course of migration of fishes. Schools of fishes, striking the net, will become entangled. This is one of the favorite methods for capturing species that move in schools at or near the surface, such as the herring, and which cannot be easily trapped or taken with the line. The seine is a long net of varying depth, weighted along the lower edge to keep this at the bottom, while the upper edge is provided with floats sufficiently strong to support the seine and keep it vertically stretched. It is usually intended to be dragged to the shore, or to some prearranged platform; but one form for use in the open sea, called a 'purse-net,' has a rope along the bottom by which that part may be gathered together, forming a deep bag, within which the fishes may be crowded into a small space near the surface, and then dipped out. Pound-nets and fyke-nets are fixed traps. Pound-nets consist of a long wing, or 'leader,' supported on stakes, and forming a fence which runs from near shore out to varying distances, and terminates in a labyrinthine inclosure forming a trap. Fishes swimming against the wing and seeking to pass around it are led out to the trap, entering which they are imprisoned. The pound-net is simply a modern and improved form of the ancient weir (still in service in various parts of the world), which was composed of stakes and wattle or lines of planted brush instead of netting. Fyke-nets are long, cylindrical bags, supported at intervals by hoops. The entrance is by a funnel leading into one or more compartments, separated by similar funnel-shaped partitions, through which the fish will not return. This net may be supplied with wings, like the ordinary pound-net or weir, leading the fish into the funnel-opening. Fykes are set at the bottom, and may be used at considerable depths. For information as to towing 'intermediate' deep-sea nets and dredges, see Deep-Sea Exploration.

Preparation and Preservation of Fish. A matter of great importance to the fishery industry is the proper preparation of the raw product for the market. The markets are generally distant from the point of capture; moreover, the season during which any species can be taken in paying quantities is usually limited. This necessity has given rise to numerous methods of preservation, all of which are modifications of freezing, drying, smoking, salting, or canning.

Freezing. For transportation of fresh fish and for their preservation the freezing method is generally adopted. For transportation they are usually simply packed in ice. To preserve them for long periods in the fresh condition they are frozen into blocks of various sizes. The fish are packed into a pan of the desired shape and size, and then subjected to very low temperatures, either through the ice-and-salt method or by the ammonia method. Frozen into blocks, they are stored until ready for the market. Such frozen fish usually lose some of their good flavor and firmness, due to evaporation during storage. On the Atlantic Coast the bluefish, halibut, squeteague, sturgeon, mackerel, flatfish, cod, haddock, Spanish mackerel, eels, etc., are thus preserved. On the Pacific Coast the salmon, sturgeon, and halibut are principally frozen. On the Great Lakes the lake trout, lake herring, wall-eyed pike, black bass, perch, sturgeon, etc., are frozen. The comparatively recent perfection of the methods of refrigeration has greatly increased the consumption of fresh fish, and has enabled consumers to enjoy many species fresh at a season in which formerly they could be had only in a smoked or salted condition. The extensive inland trade in the United States, and the liability of stored products to rapid decay, has given rise to an elaborate system of refrigerator railroad cars for their imperishable transportation.

In Drying, fish are usually first subjected to a salt cure, but under some circumstances may be directly dried. The process varies with different species, climates, and nations, but in general is as follows: The fish are cleaned and split. They are then salted, either with dry salt, allowing the pickle which forms to run off, or in brine-vats, where they remain until ready for market. They are then subjected to the drying process in the sun, much care being essential to prevent too strong sunlight acting upon them. For markets in the tropics it is essential that most of the water be extracted, but for sale in the United States the fish are much less thoroughly dried.

For Pickling, brine is almost exclusively employed in the United States. The fish are cleaned, split, and packed in salt. Brine is then added. The principal fishes pickled are the mackerel and the herring.

Smoking Fish is an old and common practice. Smoking is a powerful preservative, and adds a desirable flavor to the flesh. The fish are usually slightly cured with salt first, then smoked for a varying length of time—two to ten days. Oily species, such as the herring, haddock, halibut, salmon, etc., are those most generally smoked.

In Canning the flesh is subjected to high temperatures (boiled), placed in cans, and hermetically sealed, after which the cans are subjected to water heated to a high temperature and under pressure. Fish may be (1) plain boiled or steamed; (2) preserved in oil; or (3) prepared in vinegar, sauces, and spices. Among the more important fishery products canned are the salmon, sardine, crabs, and oysters.

Special Fisheries. The Sturgeon. Sturgeons are the objects of rather extensive fisheries in both Europe and America; in China they are also important. In Europe the Russians lead in the sturgeon fishery. In the United States the industry is of comparatively recent origin, but is already rapidly declining because of the exhaustion of the supply through indiscriminate fishing. In the United States sturgeon are taken principally by the gill-net and set lines, though many are also taken in pound-nets and seines. The flesh is almost exclusively prepared by smoking, and in both Europe and North America the roe is prepared into caviar. The swim-bladder is used for isinglass; oil is obtained, and the refuse is used as a fertilizer. The annual yield of smoked sturgeon in the United States for 1897 was about 4,000,000 pounds, with a value of $720,000. In 1898 the yield of caviar from the sturgeon in the United States was about 2800 kegs, containing from 125 to 160 pounds each, valued at about $225,000. The first value, annually, to the fisherman is about $300,000. In Russia the value of caviar obtained amounts to nearly $1,500,000 annually, which is mainly marketed in Southwestern Europe.

Herring. Under the head of herring fisheries may be considered all the clupeiform fishes, such as shad, herring, alewife, sardine, and menhaden.

The true herring, or sea herring (*Clupea harengus*), is undoubtedly the most important food-fish in existence, although in the United States its importance is much less than that of many other species. The total annual catch for the world has been estimated at about 1,500,000,000 pounds, the greater part of which is taken in Norway. The annual catch in the New England States is about 55,000,000 pounds, with a first value to the fisherman of $350,000. The herring are principally taken with seines, gill-nets, and weirs. They appear in the markets in three principal forms, namely, fresh, pickled, and smoked. In the United States there are annually frozen about 25,000,000 herring, with a market value of about $300,000. About one-third of these are used as bait for cod; the remainder are consumed as fresh food. They thus afford an excellent fresh-fish food at seasons when other fresh fish are difficult to get. The quantity of herring prepared in pickle is greater than that of all other species combined. Over 3,000,000 barrels is the annual product for the world, of which only 30,000 barrels are now prepared in the United States, a quantity much exceeded in former years. They appear in the markets in two principal forms—'round' and 'split.' In the former they are salted without the removal of gills, heart, and viscera, while in the latter they are eviscerated. The annual production in the United States of smoked herring in various forms is valued at about $285,000. They are prepared for the markets as 'hard' or 'red' herring and 'bloater' herring, the latter being a form and term used mainly in England, and originating chiefly at Yarmouth. The former differ from the latter in being subjected to the smoke at a lower temperature and for three or four weeks, while the latter are smoked at a comparatively high temperature, and only for two and a half to six days. The bloaters do not have the keeping qualities of the hard herring. In Maine young herring are extensively canned as sardines. In spite of the great increase in the herring fisheries and the enormous quantities annually taken, the abundance of the species has not perceptibly diminished.

THE SHAD (*Alosa sapidissima*) is the object of the most extensive fisheries in the United States, where it is the most important food-fish excepting the cod and the salmon. The fisheries are located along the entire Atlantic Coast streams; and the fish has been introduced into the Sacramento River, and has spread along the entire Pacific Coast northward to Alaska. Shad are taken during their entrance into the fresh-water streams for the purpose of spawning, and are captured by seines, gill-nets, and pound-nets in great quantities. The annual yield for recent years has averaged about 50,000,000 in the United States, with a first value of $1,600,000. Most of the shad are consumed fresh, being iced for shipment. A few are brine-salted, and some are smoked. The eggs of shad are to some extent made into caviar, and offer the best substitute for the sturgeon-roe.

THE ALEWIFE (*Pomolobus pseudoharengus*) is the most abundant food-fish in the east coast rivers of the United States, and next to the shad is the most important of the anadromous fishes of the Eastern States. Alewife fisheries are to be found in every Atlantic State. The catch in 1896 was 62,066,622 pounds, with a value of $459,598. They are principally caught in seines and pound-nets during their migrations up the streams for spawning purposes; many are also taken with gill-nets, fykes, and even with dip-nets. A nearly related species, the glut-herring (*Pomolobus æstivalis*), is of less importance, and more common in the Southern States. Alewives are used fresh for food, as bait for line fisheries, and are extensively brine-salted and smoked. The wholesale value of the smoked product in 1898 was about $100,000, and of the salted about the same.

THE MENHADEN is the object of an important fishery in the United States. This fish (*Brevoortia tyrannus*) occurs along the entire east coast of the United States, and is more abundant south, but is of no special value as food except for other fishes. It is canned, and salted to a limited extent, and some are eaten fresh. Their principal value lies in the oil extracted from them, and in their use as fertilizers. They are uncertain in their movements, but in favorable years over fifty vessels may be employed in the catch. The annual product is about 3,000,000 gallons of oil and 1,000,000 tons of scrap (used in the composition of fertilizers), with an aggregate value of about $2,500,000.

THE SARDINE fisheries are pursued in three principal regions, namely, the Mediterranean coasts, the coast of the Bay of Biscay, and the coast of Maine; but sardines are prepared in other places, such as Brazil and Mexico. The European sardine or pilchard (*Clupea pilchardus*) is the common form there. In the United States nearly related species are used, also the young of the sea herring, and to some extent young menhaden. This industry is of comparatively recent origin in the United States, dating from 1875. The annual product since about 1890 has averaged about $2,000,000 for the United States. The European amounts are much greater, France, Spain, Portugal, and Italy being heavy producers. The importations into the United States have aggregated nearly $30,000,000 for the past 40 years, most of which came from France. In the markets sardines appear in the canned form, put up in olive and other kinds of oils. This industry has reached its highest development in Brittany.

Another group of important fisheries is that concerned with the several salmonoid fishes. Among these are to be included the salmon, whitefishes, and smelt.

THE SALMON are undoubtedly the most important group of fishes entering the rivers of North America, and a considerable number of salmon are taken in Northern Europe and Eastern Asia. The catch of the British Islands in 1889 amounted to about $3,250,000. In North America the most important fisheries are on the Pacific Coast, where the combined annual yield of the United States, Alaska, and British Columbia is about 125,000,000 pounds, with a value of $8,200,000. The most important species is the Chinook or quinnat salmon (see SALMON); the next in importance is the abundant blue-back salmon, followed by the silver salmon, steelhead, etc. They are taken during their ascent up the streams by the usual appliances, together with the unique fishing wheel. Salmon are marketed as fresh, smoked, and canned. The canning of salmon has become one of the great industries of the world. The world's annual output exceeds $10,000,000, over 95 per cent. of which is prepared on the American continent. The total output on the west coast of North America amounted in 1892 to $6,549,000, and in 1895 to $10,081,997. The export trade, at first mainly with South America and Australia, now also includes Great Britain, which consumes annually about 500,000 cases. Smoked salmon are among the choicest of fishery products. In the United States smoking is mainly carried on in the East, but the fish come from the British Provinces. Nearly all the Atlantic salmon are smoked. The output amounts annually to about $750,000, representing about 2,800,000 pounds.

THE WHITEFISH (*Coregonus clupeiformis*) and the ciscos or lake herring (*Argyrosomus Artedi*) are highly important salmonoids. Species of these two genera are found in the lakes of Northern Asia, Europe, and North America, and all are valued as food. The whitefishes are among the most important fresh-water fishes of the world. The catch of lake herring and whitefish in the United States and Canada for the year 1893 aggregated over 70,000,000 pounds, with a value of about $2,500,000. Of this sum about 47,000,000 pounds were taken in the United States, with a value of nearly $1,000,000, of which 36,000,000 pounds were lake herring. Most of these are taken in gill-nets, but many also in pound-nets, trap-nets, and seines. Whitefish and herring are extensively frozen in the Great Lakes region, and are thus served fresh to the markets. Large quantities were formerly brine-salted, but this industry has almost wholly disappeared since the frozen-fish industry has developed. Whitefish were formerly extensively smoked, but the scarcity of this species has resulted in the substitution of the lake herring, of which there are annually prepared about 2,000,000 pounds in the more important cities along the Great Lakes.

The Lake Trout (*Cristivomer namaycush*) is next to the whitefish in importance in the Great Lakes fisheries. The disposition of these is much like that of the whitefish, and they are taken by gill-nets, pound-nets, hook and line, and in winter through the ice by spearing.

The Smelt (*Osmerus*), although the smallest of the salmonoids, is of great importance. The annual catch in the United States is about 1,700,000 pounds, with a value of $125,000. The catch in the Canadian fisheries aggregated nearly $300,000 in the year 1889. They are largely taken by seines. Smelt are canned to some extent, but the great bulk of them are marketed fresh, being extensively preserved in cold storage.

The Mackerel is one of the most valuable food-fishes in the Atlantic, and great fisheries for it are carried on in Great Britain, Ireland, Norway, Canada, and the United States. Lines, purse-seines, and gill-nets are the principal apparatus used. The most important of the several species, the common mackerel (*Scomber scombrus*), is found on both sides of the Atlantic and appears near shore in enormous schools. Trustworthy estimates by fishermen have placed the quantity of fish in some of the larger schools at 1,000,000 barrels. They appear in the spring, coming shoreward earlier in the more southern latitudes, and in autumn they return to the deeper waters. The European catch is usually limited enough to be mostly marketed fresh, but in the United States and Canada large quantities are cured. In North America most of the mackerel fisheries are on the east coast. For the ten years ending in 1886 the annual catch in the United States was over 300,000 barrels, with a value of about $2,450,000. The catch during the succeeding ten years averaged about 48,000 barrels, no year exceeding 89,000 barrels. The catch in Canada for the year 1893 was valued at $1,096,000. The quantity taken in England, Scotland, Ireland, and Norway in 1895 amounted to 399,361 barrels. Of these 46,500 barrels were salted. In 1898 the European product of salted mackerel was 50,000 barrels. The Canadian product of pickled mackerel in 1893 amounted to 67,912 barrels, worth $904,832. In the United States the proportion of salted mackerel to the total catch was in former years above 80 per cent., but in recent years it has been less than 50 per cent. The increasing demand for fresh mackerel is in part responsible for this decrease.

The Spanish mackerel, one of the choicest food-fishes, is taken in considerable quantities along its entire range on the east coast of the United States, but principally south. The yearly catch amounts to about 1,700,000 pounds, with a value of $130,000. It is taken in seines, gill-nets, pound-nets, and lines.

The tunny or horse-mackerel, which may reach a weight of 1000 to 1500 pounds, is a mackerel of most excellent flavor, and is the object of extensive fisheries in Southern Europe.

Cod Fishery. One of the world's greatest fisheries is that relating to the several species of the cod family (Gadidæ). These are common in the northern regions of both oceans. The more important species are the common cod, haddock, pollack, and hake. The countries principally engaged in the cod fisheries are Newfoundland, Canada, the United States, France, Great Britain, and Norway and Sweden, with a total annual product worth about $20,000,000. In the United States the number of vessels of not less than five tons burden which are engaged either wholly or largely in cod fisheries is not less than 600, with a total tonnage of 25,000 tons, representing a capital of over $3,000,000. Besides these there are many smaller vessels. The number of men engaged is over 7000. The common cod (*Gadus callarias*) is the most important, and is found on both sides of the Atlantic. It is taken with hand lines and trawl lines from rather deep waters—20 to 70 fathoms. The annual catch for the United States has in recent years averaged about $3,000,000, first value. The catch in 1893 for Canada amounted to $4,028,448. The haddock is extensively taken in both Europe and America. The product of Canada amounted to $466,319 for the year 1893. In the United States the annual yield is about 50,000,000 pounds, with a value of about $1,115,000. The pollack is found on the east coast of North America north of New Jersey. The annual catch in the United States amounts to about $100,000, the Canadian product amounting to about one-half this sum.

The various species of cod are marketed fresh, dried, pickled, and smoked. Very small quantities are pickled in the United States, and almost the only species smoked is the haddock. The principal form in which they are cured is by salting and drying. The world's annual product of dried codfish aggregates 600,000,000 pounds, representing 2,500,000,000 pounds of the uncured fish. The chief markets are France, Spain, Portugal, Italy, and Brazil. The bulk of this trade is carried on by Norway, Newfoundland, and Canada, and it has been steadily increasing in these countries, while in the United States the reverse is the case. Our exports of dried cod in 1804 amounted to $2,400,000, while the average annual export for the ten years prior to 1894 was 16,260,000 pounds, worth $737,084. The total amount of dried codfish prepared in the United States annually is about 80,000,000 pounds. Haddock are extensively smoked, appearing on the market as 'finnan haddie.' The United States product of smoked haddock is valued at about $200,000 annually. The secondary products of the cod are of considerable importance. These are oil, isinglass from the air-bladders, glue, etc.

Halibut, etc. Nearly related to the Gadidæ, and like them of great importance, are the flatfishes (Pleuronectidæ). The fisheries are extensive in both Europe and America. Flatfishes are bottom fishes, and many of them are found in deep waters. The principal means of capture, therefore, are the hook and line, haul-seines, pound-nets, and the beam-trawl. The latter method is almost exclusively used by the North European countries. The most important and one of the most toothsome is the large halibut, found in all northern seas. It may attain a weight of 400 pounds, though the commoner weight is less than half this. The great fishing grounds for the Atlantic trade of the United States are Grand Bank, Western Bank, Iceland, and Greenland. They are iced, and upon arrival are further prepared for sale either fresh or smoked. The most of the halibut are cured by smoking. The annual product, larger in former years than now, averages about 1,600,000 pounds, with a value of about $160,000. The Canadian catch of halibut in 1893 amounted to 215,000 pounds, with a value of $59,800. Two other species of considerable size are found in the American markets: the Greenland halibut, found in the Arctic parts of the Atlantic but not very common, and the Monterey halibut, common along the coast of California. In European waters the sole (*Solea vulgaris*) is the common flatfish taken for the markets.

LESSER FISHERIES. In addition to the foregoing more important families of fishes there are many others whose species are not so generally important, and which are not the object of so extensive special fisheries.

The most important member of the minnow family in America and Europe is the carp. In Europe it is extensively reared in artificial ponds, and in the United States upon introduction it becomes notoriously abundant. Its flesh is not highly esteemed in the United States, though extensively taken for the markets, where it frequently appears under a variety of names.

The suckers (Catostomidæ) are much eaten in the Mississippi Valley. The most important of these are the buffalo-fishes, the catch of which in 1896, exclusive of the Great Lakes, was 17,583,544 pounds, with a value of $418,949. Other suckers brought this sum up to $500,000.

Of greater commercial value than the suckers are the catfishes (Siluridæ). The catch in the Mississippi Valley amounted to 14,726,812 pounds in 1896, valued at $532,972.

The fresh-water sheepshead (*Aplodinotus grunniens*) yielded 5,246,000 pounds in 1896, with a value of $141,000. Along the east coast the sheepshead is generally regarded as one of the choicest food-fishes. The squeteague, or weakfish, and the spotted weakfish are extensively taken along the east coast of the United States.

The sea-basses (Serranidæ) include many important species, used as food in different regions of their world-wide distribution. In the United States the striped bass (*Roccus lineatus*) and the white perch (*Morone Americana*) are among the important species. The groupers are abundantly found in the markets, especially in the Southern United States and in Brazil. These are not infrequently found of great size in the markets, but are of more practicable value as objects of sport.

The wrasses (Labridæ) are numerous in species, comprising kinds much used as food. The commoner species on the east coast of the United States are the cunner and the tautog. The annual commercial catch of the latter amounts to about 1,500,000 pounds, with a value of $60,000.

Various species of pickerel (Luciidæ) are of some importance in the Northern United States and Europe. The most familiar one is the common pike or pickerel, abundant in northern regions. The Canadian maskinonge (q.v.) reaches a weight of 100 pounds or more.

The large and small-mouthed black bass and other sunfishes, such as the rock-bass, crappie, etc., are taken in considerable quantities for the markets in the United States, and the first-named has been introduced into other countries where they are now marketed. The market value of the black bass to the fishermen in the United States is about $130,000, representing 2,000,000 pounds of fish. The annual catch of crappie is less than half this amount, or 850,000 pounds.

The mullets are commonly found in the markets of both North and South America.

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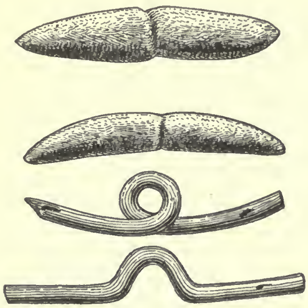
FISHER'S ISLAND. An island off the harbor of New London, Conn., at the east entrance of Long Island Sound (Map: Connecticut, H 4). It belongs to Southold Township, Suffolk County, L. I., and is about seven miles long, and one mile or less wide, with an area of about 4000 acres. The surface is undulating, the soil fertile and well adapted for agriculture. A large portion is occupied as a military reservation, and here is situated Fort Wright, which forms one of the defenses of the eastern end of Long Island Sound.

FISH-FLY. One of a group of large neuropterous insects that pass their early stages in the water and are united into the family Sialidæ, of which the alder-flies, dobson, and similar forms are also members. The name is more particularly given to the genus Chauliodes, which are distinguished from Corydalis by the comb-like or feathery feelers, and reach a great size. The fish-flies lay their eggs upon vegetation overhanging streams, whence the larvæ, as soon as hatched, drop into the water, and go about preying upon aquatic animals. "When ready to transform to pupæ," quoting Howard, "they crawl out upon the bank and are then found in cavities under stones or even under the bark of trees." See CORYDALIS.

FISH-HAWK. The popular name in North America of the osprey (*Pandion haliaëtus*), of which it is considered a geographical race distinguished as variety *Carolinensis*. See OSPREY, and Plate of EAGLES AND HAWKS.

FISHING. Primeval man hooked and caught fish by the aid of numerous devices, the most important of which were gorges, made of bronze or stone, the latter consisting of pieces of shaped stone about an inch in length with a groove in the middle for the line. One of these gorges, a relic of the Stone Age, has been discovered in France and is about eight thousand years old. The bait completely covered the gorge, which, when swallowed by the fish, turned across the fish's gullet and held it secure. After stone, bronze was used, and then bone. The early Californian Indians used shell hooks, while the Piute Indians used the spine of a cactus.

FISHING-TACKLE may be defined as consisting of rod, line, hook, reel, nets, etc. Rods are made of elastic wood, and sometimes of steel. Split bamboo is especially adapted for fly-fishing, and lancewood, hickory, or ash for any other kind. Double-handed rods for salmon-fishing are sometimes over 20 feet in length, and weigh nearly three pounds. Most rods are made in sections or joints, so that they can be taken apart and the more easily carried. Fish-lines may be of hair, silk, linen, hemp, or cotton, according to the purpose for which they are required. There is a wide variety of hooks, not only for the different fish, but variations in design for the same fish, the choice depending on the skill and preference of the fisherman. The straight hook, or one in which the point is in line with the shaft and not bent to one side, is generally regarded as the most profitable to use, although the great majority of hooks are made with flatted, ringed, knobbed, or plain ends. A particularly effective hook is the barbless hook, which has a sharp piece of wire fixed across the opening of the hook, making it almost impossible for the victim to get away after it has once impaled itself; such hooks, however, are little used. The *spoon hook* is a piece of polished metal shaped somewhat similar to the domestic tablespoon, which when drawn through the water twirls and glitters in a manner designed to attract the fish, which, if it snaps at it, is inevitably caught by the hook. This tackle is used in trolling for bluefish, pickerel, and lake trout, although in pickerel-fishing artificial flies, together with a number of hooks, are usually attached to the spoon. The *snell* is a piece of silkworm-gut connecting the hook and the line. *Sinkers* are generally small pieces of lead, or bullets cut in half, and fastened to the line; *floats*, which are made as a rule of cork and fastened to the line at both ends, serving to indicate to the fisherman the location of his hook. There are many kinds of reels, including the automatic, which winds the line when a spring is pressed. The best tackle in the market and the most experienced fishermen are practically powerless without an attractive and consequently effective bait, which ought to consist of some item from the known diet of the fish sought for; or, where that is not obtainable, of something closely resembling it. Beginning with the angleworm, or common earthworm—the larvæ of insects, grubs, artificial flies, grasshoppers, etc., the list of available bait may be extended to various kinds of animal and fish flesh, as well as the numerous pastes common with the fishermen of Europe. To be effective, the hook must be concealed by the bait as far as possible. The only *net* used by the genuine sportsman is the landing net, by which the fish is taken out of the water after it has been brought to shore or boat by the hook and line.



PRIMEVAL STONE AND BRONZE GORGES.

ANCIENT FISH-HOOKS (BONE).

ANCIENT BRONZE FISH-HOOKS, DOUBLE AND SINGLE.

Fresh-Water Fish. The fish most common to amateur fishermen are the various minnows, in many places spoken of as shiners or chubs, of which the most generally known, the dace or roach, is found in New England and the Middle States, and demands but an ordinary light rod, with worm or artificial fly for bait. The sunfish or pumpkinseed, pond-perch, bream, or roach, may be found in running brooks throughout the United States, and sometimes in tidal rivers, and are caught with small hooks, with worms as bait, although they frequently take the artificial fly. In the Southern States good sport may be obtained with artificial flies in the catching of bluefish, blue bream, and copper-nosed bream. A peculiar, though uncertain, method of fishing for the common bream in these waters is to use bait made of brown bread and honey. For all-around sport through most of the year, the yellow perch is most popular in the Eastern States. In summer it may be caught with a worm or minnow bait; and in winter holes are cut in the ice, and the white grub, usually found in decayed wood, is used as bait. In springtime the fly is most attractive. The wall-eyed pike, as the pike-perch is sometimes called, is found usually in the Southern States, western New York, the Great Lakes, and Canada, in which latter country it is known as the doree, another fish of the small species being known as the sandre. It is an exceptionally gluttonous fish, easily caught with a hook, and in Lake Champlain is occasionally caught by trolling. The pickerel, or common pickerel, which may be found in all the ponds and streams of the North, East, and Central States, together with the white pickerel of the Ohio and the black pickerel of Pennsylvania, are all distinguished by length of body. The pike seldom grows to be over three feet in length, although the maskinonge (like the pike, a member of the pickerel family) has been known in the Michigan lakes and the upper waters of the Mississippi River to be at least seven feet. The fisherman usually trolls for them with a spoon. The common pickerel weighs on an average about five pounds. Closely related are the catfish, bullhead, bull-pout, and horned pout, which are all found in North American waters. The largest catfish have been known to weigh over 150 pounds, although the flesh of the smaller kinds is the most rich, and more generally considered a delicacy. They are greedy biters and will jump at most anything. For instance, the ordinary bullheads of New England are caught on muddy bottoms with worms as bait. The premier game fish, however, is the black bass, which is plentiful in the lakes and streams east of the Rocky Mountains. It may be caught with minnows, frogs, grasshoppers, etc., or by trolling with a spoon hook. The fishing-rods required for this fish are usually about ten feet long and considerably stouter than those used for trout. The sucker is a fish found in all the fresh waters of the Northern States. It is usually caught with angleworm bait, and in the winter, fishing through the ice, it is more easily caught than any other. The carp is a comparatively recent importation from Europe, and is now found in most of the Eastern waters, as well as in California and Oregon. It haunts muddy waters. The chub, honeyhead, or river-chub is widely distributed in fresh waters, and may easily be caught by means of the same rod and tackle that is used for black bass. The grayling affords exceptionally fine sport. It is generally caught with the fly, but will also bite at worms and insects, and is found along the northern border of the United States. The true salmon is caught chiefly in Canadian rivers, as well as in the Penobscot River of Maine. The best time for sport ranges from about the middle of May to the end of July, covering a period when the fish is on its annual pilgrimage from the sea to deposit its spawn or eggs in fresh water. The newly hatched fish are known as pinks, and in their second year as smolts, and in their third year as grilse. Artificial flies are the bait commonly used. Trout, second only to salmon in their gameness, are also sea emigrants, whenever it is possible for them to be so. They are usually found to best advantage in clear streams and lakes, and angleworms, artificial flies, and minnows are used for their capture. In the rivers and lakes of Maine and Canada speckled trout of from four to six pounds are frequently seen, and specimens have been caught weighing nearly ten pounds. The lake trout is easily caught by trolling, using a minnow or spoon as bait. Whitefish is one of the best food-fishes, and is usually caught in 'pound-nets' from 500 to 1000 feet long. Eels are best caught at night, along muddy bottoms, the salt-water variety being frequently captured in eel-pot traps.

SALT-WATER FISH. The blue perch, nibbler, chogset, salt-water perch, or burgall, names frequently applied to the cunner, is found in great abundance along the coast. It is easily caught with but light tackle and almost any kind of bait, although clam bait seems to have a special attraction for them. Precedence must be given to the striped bass, or, as it is sometimes called, rock bass, which may be counted the best game fish in the United States. It is a sea-fish, but spawns in tidal rivers, and will often make its way up fresh-water streams in its search for food. Its weight ranges from 8 to 75 pounds, and the bait required may consist of anything from a piece of cotton to a small fish. (See BASS.) It is sometimes caught with the artificial fly, and again a line baited with small fish thrown into the surf as in fly-casting will be successful. The minnow is the best bait for trolling. The strength of the fish, together with its weight, demands an exceptionally expert fisherman for its capture. It is very strong, very cunning, and very game, making long and fierce runs, severely taxing the skill and strength of the fisherman before it is finally subdued and captured. The blackfish, or sea-bass, is found some little distance from the shore along the coast of the Northern States. It is caught with a special tackle similar to that used for cunners, although the former is also frequently caught with lobster bait, or in sea nets. Both these varieties are good food-fishes. One of the most common fishes in the South is the sea-chub, frequently called the Lafayette, owing to the fact that it was found in special abundance in 1824, the year of General Lafayette's visit to this country. The fish most common to all the coasts of the United States in the last half of the year is the weakfish, which, in the South, is occasionally mistaken for the trout, owing to the similarity in flavor of the two fishes. With this fish, also, the clam is the most attractive bait, and the best time for catching is usually during flood tide. It varies in weight from six ounces to over seven pounds, occasional specimens having been caught weighing over 26 pounds. The fish has a large mouth and very soft jaws, and is caught with much the same tackle as is used for black bass, the principal feature being a large hook made of fine steel. Its peculiarity as a food-fish lies in the fact that it must of necessity be eaten almost immediately after capture or its flesh will become soft. The sheepshead, a Southern fish weighing about eight pounds, is an exceptionally hard fish to secure, but is of correspondingly rare delicacy as a food-fish, and is one much valued by epicures. The scup, known in some parts as the porgie, or paugie, is found more particularly along the Atlantic coast. Another gamy fish is the bluefish (q.v.), also known as the skopjack, horse-mackerel, or snapper. Snappers are found in this part of the world anywhere on the American coast between Massachusetts and Brazil. They are best caught with a squid trolled from a sailboat, and occasionally from a line thrown out from shore. If they are running in 'schools,' the fishermen take them in great abundance with their trolling-lines. A peculiarity about them is that they keep near the surface and will snap at any living thing in sight. Like the weakfish, they suffer in value for eating purposes if kept very long before cooking. A smaller kind of bluefish is caught along the New England shore with a light tackle and a minnow bait. Along the north coast of New Jersey the smelt is caught in large seines; they spawn under much the same conditions as the salmon. The umbrella tackle used in the State of Maine is a very peculiar as well as effective method of catching the smelt. The umbrella frame is attached to the end of a fish-pole and hanging from the end of each rib is a short line and hook. Mackerel afford excellent sport, and may be fished for with hooks baited with small pieces of mackerel flesh or skin, although they are more generally taken in seines. The herring is the most common victim of commercial fishing, but it may also be caught by the individual fisherman in the springtime of the year with an artificial fly as bait. Its near relative, the shad, will also give very excellent sport when fished for with the fly. The king of the herring is the tarpon, which frequents the Gulf of Mexico and the coast of Florida. They vary in weight, but often exceed 150 pounds. They are caught on rod and line, as also are the leaping tunas of the Pacific Coast, gigantic mackerel, equaling in size and weight the tarpon. Blackfish weighing from two to nine or ten pounds, and caught by a bait of soft clams, or bits of lobster, with either hand lines or rods, may be found between South Carolina and Massachusetts Bay. In some parts it is known as the tautog (q.v.). Its favorite running places are near sunken wrecks, deserted docks, or where the coast is of rocky formation. The fish above mentioned are the ones which may legitimately be classed as game fish; most of the others, usually deep salt-water fish, as cod, haddock, whiting, and halibut, being caught principally for the market and as a means of livelihood. (See FISHERIES.) Sharking (q.v.) is occasionally indulged in off the eastern coast, and sometimes near Nantucket Island. Every State in the Union has its separate fish laws, which, however, are constantly changing in a matter of detail, although their general principles remain the same. Some fish are protected by law from capture by netting, spearing, or any other method except hook and line; and then only during certain months, known as the 'open season.' In some States it is unlawful to take fish under a regulation size or weight, and fines and imprisonments are penalties imposed for the transgression of such laws. In brief, the general trend of the law throughout the United States is to prevent the employment of any method which will destroy the supply. The reader is further referred to ANGLING; BAIT-FISHING; FLY-CASTING; GAME LAWS; GRAINING; SALMON-FISHING; SHARKING; SWORD-FISHING; TARPON-FISHING; TROLLING; TROUT-FISHING.

FISHING BIRDS. Birds subsisting by catching fish, and adapted in structure to their capture and digestion. They do not constitute a scientific group, many widely dissimilar forms having taken up and become adapted to this mode of life, not to include such out-of-the-way species as the kingfishers, and certain fish-eating birds of prey. The fishing birds proper include the larger sea-birds, such as the loons, penguins, auks, puffins, tropic-birds, frigate-birds, cormorants, and gannets; and certain fresh-water families of higher organization, such as the pelicans, darters, most herons, and some ducks. All are either powerful swimmers and divers, or else are skillful in lying in wait and snatching or piercing any fish that comes sufficiently close to their motionless forms. The instrument (except in the Raptores, which use their talons) is the beak, which is long, straight, sharply pointed, and sharp-edged, so that a firm grip may be had of the slippery bodies of their prey. A large part of the prehistoric birds were fish-catchers. Many of these birds have a special provision for bringing home a part of their catch to their young, either by swallowing it as far as the crop, whence it may be disgorged, or by storing it in a bag formed by the distensible membrane between the lower mandibles (e.g. pelicans). Certain more powerful birds (as the jäger gulls) profit by the labors of the fishing birds, compelling them to give up their prey; and men have trained the cormorant to exercise its skill for their benefit. See CORMORANT; GANNET; and other birds of this group; and Plate of FISHING BIRDS.

FISHING BOUNTIES. It was the policy of the English Government to encourage the fisheries, as schools for seamanship, in order that the navy might be readily manned in times of emergency. In the reign of Edward VI. we find statutes compelling people to keep the fast days of the old Church, although Protestantism had already been introduced. This was to keep up the demand for fish. A statute of Elizabeth went further, and removed all import and export duties from fish, and another statute of the same reign encouraged by similar exemption the Iceland trade in herring and cod. In the eighteenth century this legislation had its desired effect of excluding the Dutch from the fishing trade in England, except in the case of the whale fisheries. To meet the latter difficulty, bounties were offered in 1733 and again in 1740 and 1749 to the owners of vessels engaged in the whale fisheries. These bounties were considerable, amounting in 1755 to £55,000, but they did not have the desired effect of increasing the industry.

Following these precedents and others of Colonial times, the American Congress offered bounties to promote the fishing industry. In 1789 bounties were given for the export of dried, salted, and pickled fish; these were increased in 1797 and 1799. An act of 1792 offered extensive bounties to vessels engaged in the cod fisheries of Newfoundland. They varied from $1.50 to $2.50 on the ton, according to the size of the vessel, three-eighths of which went to the owner and the rest to the fishermen. These bounties were finally abolished in 1854. Consult: *Statutes of the Realm*, 2 and 3 Edward VI., c. 19, 5 Elizabeth, c. 5; Cunningham, *Growth of English Industry and Commerce* (Cambridge, 1892), i. 443-444; ii. 21-22, 115-116, 282-284. For American legislation, consult *United States Statutes at Large*, i. 229 sq., 260, 533, 692.

FISHING CAT. A species of wild cat (*Felis viverrina*), common in eastern India and through Burma and the Malayan Peninsula. It is 30 to 32 inches in length of body, to which must be added 9 to 12 inches of tapering tail. The general color is dark gray, sometimes reddish, striped on the head and neck and spotted elsewhere with dark brown; the throat and breast are white, and the tail barred with chestnut. The peculiarity of this cat is that it subsists mainly upon fish and mollusks of its own catching; but it is said also to be exceedingly fierce, and to carry off children. Consult Mivart, *The Cat* (New York, 1892).

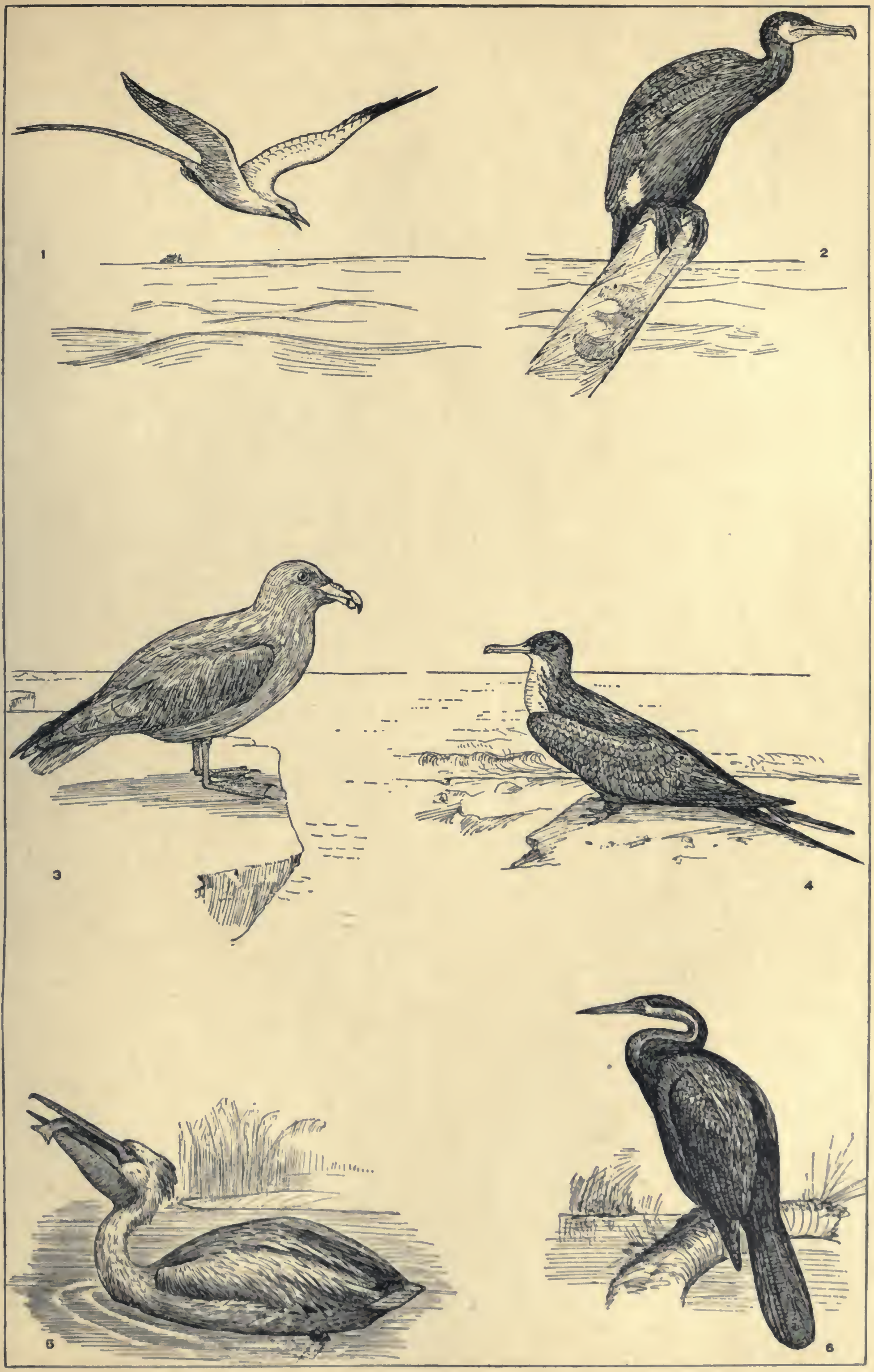
FISHING CREEK, BATTLE OF. See MILL SPRING, BATTLE OF.

FISHING EAGLE. A large eagle (*Polioaëtus ichthyaëtus*) of India and eastward, which lives by catching fish, having habits and a conformation of claws very similar to those of the osprey.

FISHING FROG. See ANGLER.

FISHING LAWS. Laws regulating the killing or taking of fish. These are divisible into

FISHING BIRDS



1. YELLOW-BEAKED TROPIC BIRD (Phaethon flavirostris).
2. CORMORANT OR SHAG (Phalacrocorax carbo).
3. ARCTIC FULMAR (Fulmarus glacialis).
4. FRIGATE-BIRD (Fregatus aquila).
5. OLD-WORLD PELICAN (Pelicanus onocrotalus).
6. AFRICAN DARTER (Plotus Levaillanti).

two classes: those which are municipal in their character and sanction, and those which are international.

Some of the rules of municipal law governing fishing rights are fully stated in the article on game laws (q.v.). In Great Britain the right of fishing within the territorial seas and navigable streams belongs *prima facie* to all British subjects. If any person claims an exclusive right in such waters the burden of proof is upon him to establish that right by royal or Parliamentary grant or prescription. In this country the same presumption obtains in favor of public fishing in territorial seas and navigable waters, but it is the State and not the National Government which ordinarily possesses the power of granting or regulating this right.

English law divides private rights of fishery into three principal classes: (1) common of fishery, or of piscary, (2) free fishery, and (3) several fishery. The first of these is not to be confounded with a common fishery which designates the public right of all comers to take fish in public waters, but is a creature of municipal law, and is a right in the nature of a profit, to fish in particular waters in common with other persons. The second term is used in two senses. By some writers and judges it is defined as a franchise or exclusive privilege of fishing in a public river, while others make the term synonymous with several fishery. The latter, all authorities agree, designates the right which the owner of the soil beneath non-navigable waters has to fish in those waters. It is a right of property which he may grant to another while reserving to himself ownership of the soil. When so conveyed and held it is a profit *a prendre* (q.v.).

A private right of fishery is held subject to the public use of navigable water as a highway and for the free passage of fish. It is also subordinate to regulations which may be prescribed by the State for the public good. Regulations of this character are now very numerous both in Great Britain and in this country. They are intended primarily to prevent the unnecessary destruction of fish and to promote fish culture. They establish close seasons during which fish of certain varieties may not be caught, they regulate the manner of catching them, they prohibit the fouling of streams and ponds, and they annex severe penalties to violations of these provisions.

International Aspect. International fishing laws are mostly regulated by convention, and the course of their development has largely depended upon the outcome of political disputes. This is especially true of the fishing laws fixed by treaty between the United States and Great Britain, and between Great Britain and France, in Newfoundland and North American waters. These played so important a part in the history of the three countries during the nineteenth century, and still present so many unsolved problems, that they demand careful consideration.

Between the United States and Great Britain the existing laws represent a working compromise, whose history runs back to 1783. In that year the Treaty of Paris, which acknowledged the independence of the United States, provided that American fishermen should continue to enjoy the right to fish in the waters of the British possessions in America, but forbade them to dry or cure fish on the coast of Newfoundland and in settled bays, harbors, and creeks of Nova Scotia, Magdalen Islands, and Labrador, unless by previous agreement with the inhabitants or possessors thereof. This arrangement continued in force until 1818, although, during the negotiations preceding the Treaty of Ghent of 1814, the views of the American and British commissioners clashed so decidedly on the interpretation of fishing rights under the Treaty of Paris that the question was ignored, as otherwise the Treaty of Ghent might not have been concluded. The superior value of the British-Canadian waters had attracted a considerable number of American fishermen, who had established themselves in the most advantageous places for curing and drying fish; and the British Government, anticipating the effect of what they considered an undue advantage, held that the War of 1812 had abrogated the fishing rights fixed by the Treaty of Paris. By the Convention of London of 1818 the United States renounced for American fishermen the liberty of fishing, subject to certain exceptions, within three marine miles of any of the coasts, bays, creeks, or harbors of the British dominions in America, except the right of entering bays or harbors for purposes of shelter, and of obtaining wood and water.

During the succeeding thirty-six years different constructions were put upon these provisions, and seizures of American fishing-vessels were made for trespassing within the three-mile limit. All these difficulties were, however, removed for a time by the Treaty of Washington of 1854, better known as the Reciprocity Treaty, by which mutual restrictions as to sea fisheries, excepting shell-fish, were done away with, and each country was granted full enjoyment of the sea-fishing grounds of the other. The termination of this treaty in 1866 by notice of the United States Government placed the whole question back again in the position established by the Convention of London, in which it continued until the Treaty of Washington in 1871 restored the mutual fishing privileges of the Reciprocity Treaty. In the treaty of 1871 provision was made for referring to arbitration the question of the greater value of Canadian fishing-waters, and by the Halifax Commission of 1877 an award of $5,500,000 was made in favor of the Dominion of Canada. This treaty, which went into operation in 1873, was terminated in 1885 according to notice given by the United States Government. The extent of the renunciation made by that government as expressed in the Convention of London was again thrown open to opposite interpretations, and, several American fishing-vessels having been seized, Congress in 1887 passed a retaliatory law authorizing the President, at his discretion, to close American ports to Canadian vessels and merchandise. The discretion was never exercised. In 1888 another attempt to compose these differences was made by the Chamberlain-Bayard Treaty, which was rejected by the United States Senate; but a *modus vivendi* pending ratification was offered by the British commissioners, and an act of the Dominion Parliament in 1890 enacted this temporary arrangement into law.

It is noteworthy that the termination of the Reciprocity Treaty of 1854 and of the Washington Treaty of 1871 was due in each case to the action of the United States Government; and likewise the proposed Chamberlain-Bayard Treaty, which was acceptable to Great Britain and Canada, was rejected because it was believed wrongly to surrender certain incontestable American rights. Apart from certain political considerations which compelled American disapproval of these treaties, there were opposite interpretations which arose some years after the Treaty of Paris of 1783, and there were also additional interpretations of treaty rights advanced by the British North American colonies, before and after confederation in 1867. As regards the Treaty of Paris, the American claim, urged by the commissioners during the negotiation of the Treaty of Ghent and on subsequent notable occasions, was that the rights guaranteed by treaty in 1783 were not new, but the continuance of proprietary rights already existing and acknowledged. Not even the restriction as to the three-mile limit, which is the especial feature of the Convention of London, is admitted by some American writers; but the terms of that convention are, nevertheless, accepted by both governments as the binding arrangement in default of a treaty superseding them. It is also contended in behalf of the United States that, by a reciprocal arrangement entered into between that country and Great Britain in 1830, and by Article XXIX. of the Treaty of Washington of 1871, American fishing-vessels are entitled to the same commercial and transportation rights as other American vessels. Further, it is claimed that the so-called 'headland doctrine,' which presumes to fix the three-mile limit by drawing a line from headland to headland instead of following the sinuosities of the coast, and by which American fishermen are prevented from entering Canadian bays and harbors to purchase supplies and tranship their catch, was not recognized by Great Britain but was an invention of the Canadian Government. It is contended, also, that the stipulations of the Convention of London which allow the entrance of American vessels into Canadian bays and harbors for repairs, shelter, wood and water should be deemed privileges on the ground of their humanity and ought not to be embodied in a treaty. The opposed contentions of Great Britain and Canada have been urged at various times by their commissioners in treaty negotiations, and in the writings and speeches of public men. It is claimed that the American fishing rights guaranteed by the Treaty of Paris of 1783 were abrogated by the War of 1812 and were in consequence ignored by the Treaty of Ghent; that the American renunciation of the liberty of fishing within the three-mile limit, as set forth in the Convention of London, is definite and final, that American fishing-vessels were not within the meaning of the reciprocal arrangement of 1830; that the headland doctrine, and the restriction of the right of American fishing-vessels in Canadian bays and harbors to the purposes only of obtaining shelter, repairs, wood and water, is urgently necessary to protect Canadian fisheries.

Such are the main opposing views. The North Atlantic fisheries since 1885 have been regulated by the Convention of London. Reference has already been made to the temporary arrangement offered by the British Commission pending the ratification of the proposed Chamberlain-Bayard Treaty of 1888, and to the enactment of this arrangement into a Canadian law. The last attempt to settle the fisheries question was made by the Joint High Commission, which met in Washington in 1899, but subsequently adjourned indefinitely without settling the various questions proposed.

The fishing laws *as between Great Britain and France* in Newfoundland waters and the Gulf of Saint Lawrence were fixed by the Treaty of Utrecht of 1713, the Treaty of Paris of 1763, the Treaty of Versailles of 1783, the Treaty of Paris of 1814, and the arrangement signed at Paris in 1885. By the first of these treaties Newfoundland was ceded to Great Britain, and the French were allowed to catch fish and dry them on land on that part only of the coast which stretches from Cape Bonavista to the northern part of the island, and thence, running down by the western side, reaches as far as Point Riche. By Article V. of the Treaty of Paris of 1763, which confirmed French rights on the coast, liberty was given to fish in the Gulf of Saint Lawrence at a distance of three leagues from the coast, and on the Cape Breton coast at a distance of fifteen leagues, the islands of Saint Pierre and Miquelon being ceded to France as a shelter to her fishermen. In 1783 the Treaty of Versailles varied the French shore fishing limit, giving up the strip of coast from Cape Bonavista to Cape Saint John, but extending the western coast limit to Cape Ray. The Treaty of Paris of 1814 confirmed these rights, and the arrangement of 1885 was entered into chiefly to calm the discontent of the British colonists of the islands, who were harassed on and ejected from the French shore. Article II. of that arrangement permits the formation of establishments on that coast shore for every other industry than fisheries, and stipulates not to disturb resident British subjects between Cape Saint John and Cape Ray passing by the north.

The conditions produced by these French rights are seriously detrimental to the interests of the colony, and the Newfoundland Legislature has refused to accept the settlements which have been proposed by various conventions. The opposing claims of the colonists and the French fishermen are clearly defined. The colonists contend that French rights under the Treaty of Utrecht do not forbid them to fish between Cape Saint John and Cape Ray so long as they do not interrupt French fishing; that the fishermen have exceeded their rights in catching and canning lobsters; that colonial settlements and enterprises, other than fixed fishing establishments, are hindered and also the working of mines; and that portions of the coast on which the French renounced their rights are worthless. The fishermen contend, on the other hand, that their rights under the treaties are exclusive, and that all British fixed settlements between Cape Saint John and Cape Ray are illegal.

Of late years the colonists have grown increasingly impatient, but the urgent friendly requests of Joseph Chamberlain, the British Colonial Secretary, have induced them to postpone for a term a final settlement. Annual agreements have been made, establishing a *modus vivendi,* until Great Britain is in a better position finally to settle the question with France and relieve Newfoundland from the anomalous position of not exercising rights over the whole of her own soil.

Consult: Paterson, *Fishery Laws* (London, 1878); Kent, *Commentaries on American Law;* Washburne, *The American Law of Real Property* (Boston, 1902); *New York Forest, Fish, and Game Law* (Albany, 1902); Doran, *Our Fishery*

Rights in the North Atlantic (Philadelphia, 1888). See GAME LAWS; FERÆ NATURÆ. For a discussion of international relations arising from the seal fisheries in Bering Sea, see BERING SEA CONTROVERSY.

FISHKILLER. One of the great aquatic bugs of the heteropterous family Belostomidæ, which prey upon fishes. They are the largest of existing bugs, some reaching a length of four inches, and have an oval outline, flat body, and a brownish hue, easily hidden. Their legs are flattened into powerful swimming organs, except the foremost pair, which are incurved and form organs for seizing and holding their victims, aided by hooks and processes on the inner surface of the tibiæ. The mouth-parts include a strong beak for stabbing the prey, from which all the blood is sucked before it is let go. At the end of the abdomen are two narrow flattened appendages, which are extensile but not concerned in respiration. The family is numerously represented in the rivers and ponds of northern Africa and southern Asia, but most extensively in America. The largest known species is *Belostoma grandis* of the Amazonian region, where it lurks on the muddy bottoms of sluggish streams and bayous, ready to seize any salamander, fish, or other aquatic animal that it can overcome. The two most abundant and largest species in the United States are *Belostoma Americanum* and *Benacus griseus*, which much resemble one another in the brown-gray color and shape, but may be distinguished by the fact that the Belostoma "has a double groove on the under side of its fore thighs which is lacking on the thighs of Benacus." These bugs swarm about electric street lights in such numbers as to be known in many places, of late, as 'electric-light bugs.' They breed and develop wholly in the water, but their life history is not well known. The females of a related genus, Zaitha, have been found to have the curious habit of depositing and fastening their eggs upon the backs of the males, who unwillingly carry them about until they hatch. Great damage may follow the introduction of these bugs into fish-cultural establishments. Consult Summers, "The True Bugs, or Heteroptera, of Tennessee," in *Tennessee Agricultural Experiment Station Bulletin*, vol. iv., No. 3 (Nashville, 1891).

FISHKILLER.

FISHKILL LANDING, or FISHKILL-ON-HUDSON. A village in Dutchess County, N. Y., 58 miles north of New York City; on the east bank of the Hudson River, opposite Newburg, with which it is connected by a steam ferry, and on the New York Central and other railroads (Map: New York, G 4). It has a picturesque location, is the seat of the De Garmo Institute, and, as one of the oldest villages in the State, is replete with historical interest. The village manufactures hats, rubber goods, Corliss engines and boilers, etc. Fishkill Landing was incorporated in 1866, and, under a revised charter of 1870, is administered by a mayor, chosen annually, and a village council, elected on a general ticket. Population, in 1890, 3617; in 1900, 3673. The town of Fishkill Landing was settled probably about 1695. In 1776 the Provincial Convention of New York met here, and from 1776 to the close of the Revolution, Fishkill was one of the principal military depots of the Northern Army. Joshua H. Smith, at whose house Arnold and André met on September 22, 1780, lived here, and at the Verplanck homestead the Society of the Cincinnati was organized in 1783. Consult: Smith, *History of Dutchess County* (Pawling, N. Y., 1877); an article, "Fishkill in the Revolution," in the *Publications of the Historical Society of Newburg Bay*, for 1894); and Verplanck, "The Birthplace of the Order of the Cincinnati," in *New England Magazine*, No. 5, vol. xiv. (Boston, 1896).

FISH-LOUSE, or SEA-LOUSE. Any of various small crustaceans (copepods) which live parasitically on the outside or in the branchial chambers of marine animals, especially fishes and whales. All are of small size, and attached either temporarily or permanently to the hosts on the juices of which they live, although many species have also the power of swimming freely in the water, some of their legs being adapted to this purpose. They do not begin life as parasites, the females depositing their eggs on stones, plants, etc. They are animals of singular form and appearance. In the genus Aragulus there is a curious sucking disk on each side of the beak, or proboscis, although there are also jointed members terminated by prehensile hooks. In the genus Caligus the hooks of the anterior pairs of feet are the principal organs of adhesion to the slippery bodies of the fishes from which food is to be drawn, and the abdomen of the female is furnished with two remarkably long tubes, the functions of which are not perfectly ascertained. The bodies of all of them are transparent, or nearly so. Consult United States Fish Commission *Annual Reports* (Washington, 1871 et seq.) for particulars as to the extensive list of species catalogued in American waters. See COPEPODA.

FISH MANURE. Dried and ground fish or fish guano is a valuable fertilizer obtained mainly from two sources: (1) The refuse from fish packing and canning establishments, and (2) the pomace from the extraction of oil from fish—in America, chiefly the menhaden. The product from the latter source is especially rich in fertilizing constituents, containing from 7 to 8 per cent. of nitrogen and 6 to 8 per cent. of phosphoric acid. The availability of the nitrogen is nearly as great as that of dried blood and tankage. The phosphoric acid is frequently more available than that in other organic matter. The availability of the fertilizing constituents depends largely upon the proportion of oil present. A considerable proportion of the latter delays decomposition in the soil, and thus reduces the availability. The oil is removed and the fish prepared for use as a fertilizer on a commercial scale by cooking with water in tanks heated with steam. The oil rises to the surface of the water and the two are drawn off together. The residue is pressed, dried, and ground. In some cases, after the first pressing, the material is subjected to the action of steam under pressure and sulphuric acid (5 per cent.) to render the fertilizing constituents more available. The uncooked fish is sometimes treated directly with sulphuric acid to prevent offensive decomposition and to increase the availability of the nitrogen and phosphoric acid.

Fish manures are prepared and used in considerable quantities, especially along the northeastern coast of America, in Norway, and other regions where the supply of material is abundant. Fish manure is exported in considerable quantities from Norway.

In localities where it can be readily obtained from fishermen, fish-scrap is frequently used without preparation of any kind. Naturally, this product is very variable in composition, the nitrogen ranging from 2.5 to 8 per cent. and the phosphoric acid from 2 to 6 per cent. The fertilizing constituents of this material are less available than those of the dried and finely ground fish. The whole fish are also sometimes used as a manure, either directly or composted with other materials. It is stated in Bradford, *History of Plymouth Plantation* (Boston, 1856), that the Indian Squanto first taught the New England colonists to use the menhaden as a fertilizer for corn, instructing them to put the fish under the hills at the time of planting. (See also MANURES, AND MANURING.) Consult: Voorhees, *Fertilizers* (New York, 1898); Aikman, *Manures and the Principles of Manuring* (Edinburgh, 1894); Storer, *Agriculture* (7th ed., New York, 1897).

FISH OF PARADISE. An East Indian fish (*Macropodus viridiauratus*) related to the gouramis, and noted for its extended fins and brilliant colors. It is cultivated for ornamental aquariums.

FISH-OWL. See KETUPA.

FISH PLATE (so called from overlapping, like the scales of a fish). A name given to a flat plate or bar of iron employed in pairs to connect the ends of adjacent rails in railway track. The two plates are placed on opposite sides of the webs of the rails, and are held by bolts passing through the plates and the webs of the two rails. The fish-plate joint was invented in America, in 1830, by Col. R. L. Stevens, and was first used on the Camden and Amboy Railroad. In order to increase the strength of the joint, the angle bar was devised about 1868 or 1870, having a vertical web like the fish plate and an inclined flange extending over the rail-base. The angle-bar joint is now almost universally employed. A full discussion of rail-joints is contained in Tratman, *Railway Track and Track Work* (New York, 1900). See RAILWAYS.

FISHTAIL PALM. See CARYOTA.

FISK, CLINTON BOWEN (1828-90). An American soldier and politician. He was born at Griggsville, N. Y., spent some years as a merchant in Michigan, and then removed to Saint Louis, Mo. At the beginning of the Civil War he entered the Union Army, and in 1865 was brevetted major-general. Subsequently he devoted his life largely to the interests of the colored race; was assistant commissioner in the Freedmen's Bureau, and was instrumental in founding Fisk University. In 1884 he left the Republican Party and identified himself with the temperance movement. He was Prohibition candidate for Governor of New Jersey in 1886, and for President of the United States in 1888.

FISK, FIDELIA (1816-64). An American missionary. She was born in Shelbourne, Mass.; graduated from Mount Holyoke, went to Persia as a missionary of the American Board among the Nestorians in 1843, and later became first principal of the seminary for women at Oroomiah. She wrote *Recollections of Mary Lyon* (1866). Consult D. T. Fiske, *A Memoir of Fidelia Fisk; Faith Working by Love* (Boston, 1869).

FISK, JAMES, JR. (1834-72). An American stock speculator. He was born in Bennington, Vt., the son of a peddler, and received scanty schooling. After trying various other occupations, he took up that of his father, and finally attracted the attention of Jordan & Marsh, the Boston merchants, of whom he bought his wares, and as a member of that firm enriched them and himself by shrewd bargaining with the Government and, it was said, by smuggling cotton through the lines during the Civil War. Four years later he opened a brokerage office in New York City. He picked up a precarious living for some time, until Daniel Drew set him up in business with a man named Belden, using them as his agents in his famous struggle with Cornelius Vanderbilt for the control of the Erie Railway. As a result of a compromise, the Drew-Fisk interest combined with the Eldridge-Gould interest, forced the Vanderbilt faction out of the directorate, installing Fisk and Jay Gould in their stead. This marked the beginning of the notorious association of Jay Gould and James Fisk, which terminated only with the death of Fisk. Gould became president of the Erie Railroad, and Fisk the vice-president and comptroller. From their headquarters a campaign of bribery and corruption was carried on that brought under the power of these men city, State, and Federal officials, judges and legislatures, reaching its climax in the gold conspiracy of 1869 and 'Black Friday,' when an attempt was made to control President Grant himself. A quarrel with one of his partners, E. S. Stokes, three years later, culminated in his death at the hands of the latter. Consult: Adams, *Chapters of Erie, and Other Essays* (New York, 1886); Black, *Essays* (New York, 1890).

FISK, WILBUR (1792-1839). An American educator and clergyman. He was born at Brattleboro, Vt.; graduated at Brown University, and afterwards studied law, but in 1818 entered the Methodist ministry. With others, he founded an academy at Wilbraham, Mass., of which, in 1825, he became the first principal. He also aided in the founding of Wesleyan University, at Middletown, Conn., and became its first president in 1831. He had previously refused the presidency of La Grange College (Alabama), and in 1836 declined an election as bishop in the Methodist Episcopal Church. Among his works are: *Sermons and Lectures on Universalism; Reply to Pierpont on the Atonement; The Calvinistic Controversy* (1837); and *Travels in Europe* (1838). For his biography, consult Holdich (New York, 1842) and Prentice (Boston, 1890).

FISKE, AMOS KIDDER (1842—). An American journalist and author, born at Whitefield, N. H. He graduated at Harvard in 1866, was admitted to the bar of New York County in 1868, assisted G. T. Curtis (q.v.) in the preparation of the latter's *Life of Daniel Webster* (2 vols., 1870), contributed to the revised edition of the *American Cyclopædia* of Ripley and Dana (1873-76), and for many years was connected with the editorial staff of the *New York Times.* In 1900 he became a member of the staff of the *New York Mail and Express.* His publications number: *Midnight Talks at the Club* (1890); *Beyond the Bourn* (1891); *The Jewish Scriptures* (1896); *The Myths of Israel* (1897); *The Story of the Philippines* (1898); and *The West Indies* (in the "Story of the Nations," 1899).

FISKE, Daniel Willard (1831—). An American scholar, born in Ellisburg, Jefferson County, N. Y. He was educated at Hamilton College, but left before graduating to go abroad and devote his time to a study of the Scandinavian language and literature. He spent the years 1849-52 at the University of Upsala, supporting himself by teaching English and lecturing on American literature. From 1852 to 1859 he was an assistant in the Astor Library, New York City, and devoted much of his attention to gathering its valuable Scandinavian collection. He edited the *American Chess Monthly* (1857-60), and published *The Book of the American Chess Congress* (1859). In 1861-62 he was an attaché of the American Legation at Vienna, under John Lothrop Motley. He was editor of the *Syracuse* (N. Y.) *Daily Journal* in 1864-66, and of the *Hartford* (Conn.) *Courant* in 1867-68. In the latter year he was elected professor of North European languages and librarian at Cornell University. In 1881 he resigned, and removed to Florence, Italy. His collection of books relating to Icelandic history and to Petrarch is the largest in the world.

FISKE, John (1842-1901). An American philosopher and historian. His original name was Edwin Fiske Green, but on the second marriage of his mother (1855) he assumed the name of his maternal great-grandfather, John Fiske. He was born at Hartford, Conn., March 30, 1842. As a child he exhibited remarkable prococity. He was graduated at Harvard College in 1863, and at the Harvard Law School in 1865; but he never practiced law, having already, in 1861, inaugurated his literary career by an article on Mr. Buckle's fallacies, in the *National Quarterly Review.* In 1869 he began a career of distinguished success as a lecturer at Harvard, his general subject being *Philosophy in Its Evolutionary Aspect.* In 1870 he was made instructor in history there, and in 1872 assistant librarian, a post which he resigned in 1879. In 1884 he was made professor of American history in Washington University, Saint Louis, having held a lectureship there since 1881, and lectured annually for some years, though continuing to reside in Cambridge. His reputation was already international, for he had lectured on American history at University College, London, in 1879, and at the Royal Institution of Great Britain in 1880. During the earlier part of his career his interest was very largely absorbed by the study of evolution, and it was as a popularizer of its philosophy that he first won a national reputation, through *Outlines of Cosmic Philosophy* (1874). Essays and studies on allied subjects appeared under the titles: *Myths and Myth Makers* (1872); *The Unseen World* (1876); *Darwinism and Other Essays* (1879; revised and enlarged, 1885); *Excursions of an Evolutionist* (1883); *The Destiny of Man Viewed in the Light of His Origin* (1884); and *The Idea of God as Affected by Modern Knowledge* (1885). This last work, supplemented by his *Origin of Evil* (1899), may be regarded as a final epitome of his religious and philosophic views. *American Political Ideas Viewed from the Standpoint of Universal History* was published in 1885, and with this began the fifteen years devoted to investigations in American history, which must be regarded as at once the most popular and the most valuable of his contributions to American literature and to the molding of the national life. His contributions in book form to the history of his country were: *A Critical Period of American History, 1783-89* (1888); *The Beginnings of New England* (1889); *The War of Independence,* a book for young people (1889); *Civil Government of the United States* (1890); *The American Revolution* (2 vols., 1891); *The Discovery of America* (2 vols., 1892); *A United States History for Schools* (1895); *Old Virginia and Her Neighbors* (2 vols., 1897); *Dutch and Quaker Colonies in America* (2 vols., 1899); *Essays, Literary and Historical* (1902); and *New France and New England* (1902). These various works may be said to constitute practically a connected history of the United States from the first discoveries to the establishment of federal government. In addition, he edited, with Gen. James Grant Wilson, *Appleton's Cyclopædia of American Biography* (1887). It is less as an investigator, however, than as an educative force that he is to be esteemed. More than any other writer of his generation he brought home to the national consciousness a philosophic view of American history, by his remarkable power for lucid statement of balanced judgments. To his zeal of acquisition was joined an equal zeal to impart, and his admirable style made the work of following him anything but labor. He died prematurely, worn out by overwork, at Gloucester, Mass., July 4, 1901.

FISKE, Minnie Maddern (1865—). A prominent American actress, born in New Orleans, of theatrical parents, her father, Thomas Davey, being a manager. Maddern was her mother's family name. From infancy her life was largely spent in the theatre, and at three years she made her regular appearance upon the stage. Throughout her childhood she played at times with many well-known actors like Laura Keene, John McCullough, and, later, Barry Sullivan and E. L. Davenport. Occasionally she even took old women's parts, and at thirteen appeared as the Widow Melnotte with great success. When sixteen years old Miss Maddern was brought out as a star (May, 1882, in *Fogg's Ferry*), and thus for several years she won some success; but her rôles were not on the whole well suited to her. In March, 1890, she was married to Harrison Grey Fiske, and retired for over three years of rest and study. In the fall of 1893 she reappeared in New York in her husband's *Hester Crewe;* she played also the part of Nora in Ibsen's *A Doll's House,* and later for some time resumed her Western tours. In 1897 she made a sensation in *Tess of the D'Urbervilles.* Since then she has appeared in *A Bit of Old Chelsea; Little Italy; Frou Frou; Magda;* and other plays, of which her *Becky Sharp* (1899) is considered her greatest achievement. In the season of 1901-02 she opened the Manhattan Theatre as an independent New York play-house, where she produced *The Unwelcome Mrs. Hatch.* Mrs. Fiske is an actress of strong intelligence and no little power of dramatic realism, with an insistent quality which, if at times verging upon mannerism, is capable of great effect in passages of sustained emotion. Consult: Strang, *Famous Actresses of the Day in America* (Boston, 1899); McKay and Wingate, *Famous American Actors of To-day* (New York, 1896); Hapgood, *The Stage in America, 1897-1900* (New York, 1901).

FISKE, Stephen (1840—). An American journalist and author, born at New Brunswick, N. J. He was educated at Rutgers College (New Brunswick), became a special correspondent and editorial writer for the *New York Herald,* and in a reportorial capacity accompanied Prince Albert Edward (later Edward VII.) on the latter's American tour. Subsequently he corresponded for the *Herald* during a part of the Civil War, and became dramatic critic of that journal. At one time he was impressario of the Royal English Opera, London. He was later appointed dramatic critic of the *Spirit of the Times,* of New York City. His writings comprise several plays, including an adaptation of Dickens's *Martin Chuzzlewit, Holiday Tales,* and two collections of Sketches, *English Photographs* and *Offhand Portraits of Prominent New Yorkers* (1884), the latter containing much interesting material originally published in the *Knickerbocker* magazine.

FISK UNIVERSITY. An institution for the education of colored persons, founded in 1866, at Nashville, Tenn., by the American Missionary Association of New York and the Western Freedman's Aid Commission of Cincinnati. The university early became well known through the efforts made on its behalf by Gen. Clinton B. Fisk, from whom the institution took its name, and from the 'jubilee singers,' composed of its students, who toured the United States and Great Britain, raising $150,000 for the institution's needs. The university at present comprises theological, normal, college, preparatory, music, and industrial departments. The attendance in all departments in 1902 was over 500. At the same time the total value of the university property was about $350,000, and the annual income from endowment and tuitions about $6000. It has had two presidents, E. M. Crawath, D.D., and G. G. Merrill, D.D.

FISSION, fĭsh′ŭn (Lat. *fissio,* from *findere,* to split; connected with Skt. *bhid,* to split, Goth. *beitan,* OHG. *bīzzan,* Ger. *beissen,* AS. *bītan,* Eng. *bite*), in plants. A term which has been applied to cell-division in general, but which is now becoming restricted to cell-division in the bacteria and blue-green algæ (Cyanophyceæ), and to the splitting of chromosomes. (See Cell.) In animals of lowest organization, the process of reproduction (q.v.) by 'budding' or cell-division.

FISSION FUNGI. See Schizomycetes.

FIS′TULA (Lat., pipe). A term formerly applied to such an abscess (q.v.) as had contracted to narrow, hard, open passages in the soft tissues of the body, lined by a kind of false membrane, giving rise to a thin discharge. At the present time the term fistula is generally limited to the opening of such a passage when in close contact with a mucous membrane, the word 'sinus' being used in the former sense. Thus, it is common to speak of salivary fistulæ, urinary fistulæ, etc.; and the most common and troublesome kind of all is the *fistula in ano,* in connection with the lower bowel or rectum. The treatment of fistula should only be intrusted to experienced surgeons. Modern surgery has done much to secure certainty in the treatment of anal fistula; and it is due to the skill of American surgeons, and especially to that of J. Marion Sims, of New York, that a cure for the distressing condition known as vesico-vaginal fistula has been devised.

In farriery, the name is given to a pus-discharging abscess usually situated on the withers of a horse. When it appears on the head it is called poll evil. Such abscesses are usually due to chafing halter, harness, or saddle, or to blows. Horses with high withers, or saddle-horses with low withers upon which the saddle rides far forward, are especially liable to this affection. The most satisfactory treatment is to open the abscess at its lowest point, so as to allow for drainage, and to wash out with antiseptic solutions.

FIS′TULI′NA. See Fungi, Edible and Poisonous.

FITCH, or **FITCHEW,** fĭch′ū (from ODutch *vitsche, visse, fisse,* polecat). The European polecat (q.v.).

FIT (AS. *fitt,* struggle, of unknown etymology). A name popularly applied to a convulsion (q.v.), or, indeed, to any sudden seizure of disease implying loss of consciousness. (See Hysteria; Epilepsy.) The term is also used colloquially to designate a mood or a temporary change in mental attitude, without disease, as denoted by such expressions as 'a fit of the blues,' 'a fit of abstraction,' 'an economical fit,' etc.

FITCH, Ebenezer (1756-1833). An American educator, born in Norwich, Conn. He graduated at Yale in 1777, and for some time was tutor there. In 1791 he became principal of the school at Williamstown, Mass., and when it became Williams College he was elected its first president, which position he resigned in 1815, to become pastor of the Presbyterian Church at Bloomfield, N. Y.

FITCH, Graham Newell (1809—). An American legislator, born in Le Roy, N. Y. He studied medicine, and removed to Logansport, Ind., in 1834. From 1844 to 1847 he was a professor in Rush Medical College, Chicago, and from 1878 to 1883 in the Indiana Medical College. From 1836 to 1839 he was a member of the State Legislature, and from 1849 to 1853 was in Congress. In 1857 he was elected to the United States Senate, and served until 1861. In the fall of that year he was commissioned colonel of the Forty-sixth Indiana Volunteer Infantry, which he had himself raised. Late in 1862 he was compelled to resign, as a result of wounds received in action.

FITCH, John (1743-98). A distinguished American inventor, who was one of the first to apply steam to the propulsion of boats. He was born at Windsor, Conn., and was the son of a farmer. After receiving a common-school education he made a few voyages before the mast, and at the time of the Revolution he became a sutler with the American Army, and amassed extensive profits, which he invested in Virginia. In 1780 Fitch became deputy surveyor of Kentucky, and a year later, while traveling, was captured by the Indians, but soon released. He next devoted himself to the production of a map of the Northwestern country, and the idea of employing steam in the navigation of the Western rivers, on which he sailed, having occurred to him, he sought by the sale of this map to obtain the means for his experiments. Unsuccessful in this, he next sought help from the State Legislatures, but failed to obtain an appropriation. He at last succeeded in forming a company, and, with the assistance thus obtained, constructed a steam packet, which was launched on the Delaware in 1787, and reached a speed of three miles an hour. This boat was fitted with paddles at the sides, which were moved forward and back in a manner similar to that followed in propelling a canoe. A second boat had similar paddles at the stern. Fitch had obtained exclusive rights of steam navigation in New Jersey, Pennsylvania, and Delaware, and in 1790 built a boat to convey passengers on the Delaware River for hire. The scheme proved unfortunate, and the company which sustained him was dissolved. In 1793 he went to France, with the hope of introducing his invention, but failed, and returned to America disheartened and impoverished. In 1796 he constructed a small screw steamboat, with which he experimented on the 'Collect' Pond in New York City. In the meantime his Virginia lands had fallen a prey to 'squatters,' and, heartbroken by his failures and disappointments, he committed suicide. Consult: Westcott, *Life of John Fitch* (1857), and, for a brief account of his work, Thurston, *Growth of the Steam Engine* (New York, 1878).

FITCH, Leroy (1835-75). An American naval officer, born in Indiana. He graduated in 1856 at the United States Naval Academy, served during the Civil War in the Mississippi Squadron, and rose in 1870 to be commander. He participated in the capture of Fort Donelson and Fort Pillow, and in 1863, while commanding the *Moose*, he prevented Morgan's attempted crossing of the Ohio River, and captured the wagon train and part of the artillery of that leader. Subsequently he directed the defense of Johnsonville, Tenn., against Gen. N. B. Forrest.

FITCH, Ralph. An English merchant and traveler of the sixteenth century. Nothing is known of his birth or early life. In 1853, with several other Englishmen in the service of the Levant Company, he set out on a journey to the Far East. The party traveled from Aleppo, in Syria, down the valley of the Euphrates to Basra, at the head of the Persian Gulf, being the first Englishmen known to have made the overland trip. Continuing their journey to Ormuz, they were there imprisoned by the Portuguese Governor. From Ormuz they were conveyed as prisoners to Goa. After some months spent in captivity the prisoners were released, and Fitch and two companions started overland across India. Fitch ultimately parted company with his companions, and, after spending some time in the valley of the Ganges, took ship to Pegu, near Rangoon, in Burma, which country he was the first Englishman to visit. From Pegu he traveled through Siam, and visited Malacca and Singapore, returning thence to Pegu, Bengal, and, by way of the Malabar coast, to Goa, whence he returned to Europe by the same route over which he had come, and arrived in England in 1591, after an absence of eight years. He continued in mercantile business, and was probably one of the promoters of the East India Company. His account of his journey has been printed in Hakluyt's *Voyages* and in Pinkerton's *Collections of Travels* (London, 1812-14).

FITCH, Simon Walbrooke (1820—). A Canadian surgeon, born in Horton, Nova Scotia. He graduated from Edinburgh University in 1841; practiced medicine and surgery in Saint John, N. B., Portland, Maine, and New York City; and afterwards became consulting surgeon of the Victoria General Hospital at Halifax, N. S. He invented several important surgical instruments for uterine and gynecological subjects, and contributed widely to surgical journals in Europe and America. His published works include: *Lithotomy* (1858); *Excision of Uterine Tumors* (1862); *Medical and Surgical Practice in Great Britain* (1872); *Three Great Ovariotomists* (1872); *Paracentesis, Aspiration, and Transfusion* (1886).

FITCH, William Clyde (1865—). An American playwright. He was born in New York, and educated at Amherst College, where he was graduated in 1886. He had already published a story, *The Knighting of the Twins*, when he produced his first play, *Beau Brummel*, which was brought out by Richard Mansfield at the Madison Square Theatre, New York, in 1890. Since then he has become the author of a surprising number of pieces, besides adaptations, such as *The Masked Ball*, from the French and German. Among his plays are: *Betty's Finish; Frédéric Lemaître; A Modern Match; Pamela's Prodigy; April Weather; Mistress Betty; The Moth and the Flame* (a development from his earlier one-act *Harvest*); *Nathan Hale*, which has been his greatest success (produced December 31, 1898, in Chicago, by Nat. Goodwin and Maxine Elliot; published, New York, 1899); *The Cowboy and the Lady; Sapho* (from Daudet's novel); *Barbara Frietchie* (published New York, 1900); *The Climbers; Captain Jinks of the Horse Marines; Lovers' Lane; The Way of the World; The Last of the Dandies; The Girl and the Judge;* and *The Stubbornness of Geraldine.* Besides his comedies and other writings, he has published a novel, *A Wave of Life.*

FITCH'BURG. A city (including the villages of West Fitchburg, South Fitchburg, Cleghorn, Crockerville, Rockville, and Traskville) and one of the county-seats of Worcester County, Mass., 25 miles north of Worcester and 50 miles northwest of Boston; on a branch of the Nashua River, and on the Fitchburg division of the Boston and Maine, and the New York, New Haven and Hartford railroads (Map: Massachusetts, D 2). It is the seat of the Fitchburg State Normal School, and has a public library, Burbank Hospital, an old ladies' home, and a children's home. The industrial interests include granite quarries, and manufactures of cotton yarns and woolens, ginghams, zephyrs, worsteds, cars, firearms, bicycles, steam-engines, electrical appliances, saws, paper, machinery, tools, etc. Fitchburg was settled in 1719, but formed a part of Lunenburg until 1764, when it was incorporated. It was chartered as a city in 1872. The government is administered, under the original city charter, by an annually elected mayor and a bicameral city council, of which the upper house is elected at large and the common council by wards. With the consent of the board of aldermen, the executive nominates the park commission, board of health, license commission, library trustees, and police department; all other municipal officials are elected by the council. The city owns and operates its water-works. Population, in 1890, 22,037; in 1900, 31,531. Consult Torrey, *History of the Town of Fitchburg* (Fitchburg, 1865).

FITCHY, or **FITCHEE** (from Fr. *fiché*, p.p. of *ficher*, to drive in, It. *ficcare*, to fix, from Lat. *figere*, to fix, to fasten). A term in heraldry signifying pointed, and usually applied to a cross the lower arm of which has been sharpened so that it may be fixed in the ground. This form is derived from the crosses carried by pilgrims as walking-sticks. See HERALDRY.

FITGER, fĭt′gẽr, ARTHUR HEINRICH WILHELM (1840—). A German poet and historical painter, born at Delmenhorst (Oldenburg). He was a pupil of Cornelius and Genelli at the Munich Academy; later he studied at Antwerp, Paris, and Rome, and in 1869 established his studio in Bremen. As a painter he became known for his large decorative works, executed chiefly at Bremen. The *motif* of these is derived for the most part from the legendary or the purely fantastic, and elaborated with a wealth of coloring acquired from Rubens and the Venetians. They include a frieze (in monochrome), representing the development of German civilization, for the Rutenhof, Bremen; the frieze for the gallery of the Bourse in that city; fourteen pictures for the banquet hall of the ducal residence at Altenstein, Saxe-Meiningen; "The Four Elements" for the Kunsthalle of Hamburg; the decorations for the salle-des-fêtes of the Bremen Künstlerhaus; and paintings for the Hamburg Town Hall. His publications include: *Adalbert von Bremen*, a tragedy (1873); *Die Hexe* (1875), a philosophical drama, marked by a considerable dignity of expression and skillful character drawing; *Von Gottes Gnaden* (1883), a political drama, stilted in expression and puppet-like in action; *Fahrendes Volk* (1875; 4th ed. 1894), and *Winternächte* (1881), volumes of poems. He also rendered into German (1886) Byron's *Marino Faliero*, and for the *Denkmale der Geschichte und Kunst Bremens* (1877) prepared a history of the local cathedral.

FITTIG, fĭt′ĭk, RUDOLF (1835—). A German chemist, born at Hamburg. He studied chemistry at Göttingen, and became assistant to Wöhler, the celebrated organic chemist, in 1858. From 1860 to 1870 he taught at Göttingen, in the latter year was appointed full professor of chemistry at Tübingen, and in 1876 was made professor at Strassburg. His literary activity consisted mainly in his reëditing Wöhler's work on organic chemistry. On the other hand, his name is connected with a number of original contributions, which have formed an integral part of the science of organic chemistry. He discovered the interesting class of substances termed *lactones* (anhydrides formed from compounds which are at once acids and alcohols, just as *esters* are formed by the action of acids on alcohols). Furthermore, he effected the synthesis of a number of interesting compounds of carbon and hydrogen, and discovered phenanthrene and other important substances in coal-tar.

FITTING, fĭt′ĭng, HERMANN HEINRICH (1831—). A German jurist. He was born at Mauchenheim, and studied at Würzburg, Heidelberg, and Erlangen. In 1857 he was appointed professor of Roman law at Basel, and in 1862 he was called in the same capacity to Halle. From 1864 to 1878 he was engaged in publishing the *Archiv für die civilistische Praxis.* He wrote *Der Reichscivilprozess* (7th ed. 1890) and *Das Reichskonkursrecht und Konkursverfahren* (2d ed. 1883).

FITZ (AS. *fiz*, OF. *fis*, *fils*, Fr. *fils*, from Lat. *filius*, son). An old Norman word signifying 'son.' Like the Scotch *Mac*, the Irish *O'*, and the Oriental *Ben*, it is prefixed to proper names to signify descent, as in the Norman names Fitzwilliam, Fitzwalter, Fitzgerald. A later application of it has been to denote the natural sons of royalty, as in Fitzroy, Fitzjames, and Fitzclarence.

FITZAL′AN, HENRY, twelfth Earl of Arundel (c.1511-80). An English statesman, son of Willian and Anne Percy. He was a godson of Henry VIII., and early entered his service. For his part in the storming of Boulogne (1544) he was rewarded with the office of Lord Chamberlain, in which position he was retained by Edward VI. But Warwick was jealous of Arundel's influence over the King, and removed him from the council on charges which were never proved. In 1551, when Somerset was for a second time sent to the Tower, a strong effort was made to implicate Arundel, and he was pardoned only on signing a confession of his guilt and paying a heavy fine. Arundel feigned acquiescence in Northumberland's plan to bring Lady Jane Grey to the throne, and at the same time worked eagerly for Mary. He kept in favor with her while she was Queen, and was made her Lord Steward; but in spite of her kindness, he dared to remonstrate with her on her treatment of Elizabeth. When Elizabeth was crowned, Arundel was Lord High Constable and was kept in office, but quarreled with her in 1562 after she had reproached him for planning for the succession during her illness, and two years later resigned his post as Lord Steward. Received again into the Queen's favor, he began to plot in behalf of Mary Stuart, and tried to bring about her marriage with Norfolk, which he trusted would result in the overthrow of Elizabeth. On the discovery of the plot he was kept under guard during the Northern Insurrection; but he had not committed himself in the rebellion, and in 1570 was recalled to the council. A year later, when it was proved that he had long been plotting sedition, he was arrested and kept under guard in his own house. The last three years of his life were passed in quiet retirement.

FITZALAN, RICHARD, Earl of Arundel and Surrey (1346-97). An English admiral, and a leader of the barons against King Richard II. He was son of Richard and Eleanor Fitzalan, and succeeded his father in 1376. He was one of the standing council appointed by the Good Parliament, was chief butler at Richard II.'s coronation, and in 1380 was made a commissioner to regulate the royal household. He had been appointed Admiral of the West and accomplished very little, though his victory over the French off Margate (1387) is called by French historians the salvation of England from invasion. He joined the baronial opposition and attacked the King's favorites (1386). A year later the King, having got his judges to declare Arundel's commission illegal, tried to arrest him, but was unsuccessful and only strengthened the opposition and drove it to arms. In 1388 the Earl went to sea again and brought home much loot from La Rochelle. Later in the year, with the other lords appellant, he was retired from the council, but soon after was restored. Peace now seemed assured, but a personal quarrel between Arundel and John of Gaunt about 1393 renewed the trouble, and soon after Fitzalan, his brother Thomas, who was archbishop, Gloucester, and Warwick formed a conspiracy against the King. This was discovered by the King, and Arundel, urged by his brother, surrendered himself, was impeached, condemned, and executed. He had been very popular among the people, who now considered him a saint and made pilgrimages to his tomb. His death hurried the end of the King's reign.

FITZALAN, Richard, Earl of Arundel and Warrene (c.1307-76). An English soldier and admiral of Edward III., second Richard of the house, son of Edmund and Alice Warrene. He did not come into the title until 1330, after the death of Mortimer. In 1337 he was made joint commander against Scotland; after the failure to capture Dunbar was put in sole command; completed a truce with the Scotch, and followed Edward III. to Brabant. Parliament made him admiral in 1340. He fought at Sluis; was a commissioner to Parliament in 1341, and took part in the siege of Tournai. In 1344 he was one of the lieutenants of Aquitaine, and in the following year put away his wife, Isabella le Despenser, and married Eleanor, widow of Lord Beaumont and daughter of Henry of Lancaster. He commanded one of the three divisions at Crécy, and was in the siege of Calais. In the years immediately following, he was treating with the Pope, and after taking part in the battle of Winchelsea (1350) was employed on diplomatic service in Scotland, Luxemburg, and France. But from 1365 on he seems to have retired; in that year he was summoned before the Pope by William de Lenne, Bishop of Chichester, but was successful in his resistance, thanks to the help of the King. He probably took part in the expedition to relieve Thouars in 1372. He was very rich and made heavy loans to the hard-pressed King.

FITZALAN, Thomas, Earl of Arundel and Surrey (1381-1415). An English soldier under Henry IV. He was son of the third Richard Fitzalan and Elizabeth Bohun. On his father's death, the boy of sixteen was put in the keeping of John Holland, Duke of Exeter, who treated him brutally and tyrannically. He finally managed to escape from Reigate and joined his uncle Thomas, the deposed archbishop, and with him cast in his fortunes with Henry of Derby, with whom he landed at Ravenspur in 1399. Henry's success made Richard able to take vengeance on the Hollands; his estates and titles were restored to him, and he fought for several years against Owen Glendower, but accomplished practically nothing. In 1405 he helped put down the revolt of Scrope and Mowbray, and showed great cruelty in putting the leaders immediately to death, against the advice of his uncle. In 1405 he accompanied the King into Wales and fought with less ill fortune than before. At the end of the year he married Beatrix, a natural daughter of John I. of Portugal. Henry V. named him treasurer, Constable of Dover, and guardian of the Cinque Ports, and took him with him into France. He was taken sick at Harfleur and died on his return to England, leaving no children.

FITZBALL′, Edward (properly Ball) (1792-1873). An English dramatist. He was born at Burwell, Cambridgeshire, was educated in a private school at Newmarket, and became a printer's apprentice in 1809. In 1819, after having unsuccessfully edited a magazine at Norwich, he changed his name to Fitzball, by prefixing his mother's name to his own, and began to write for the stage. His first success was won by his *The Innkeeper of Abbeville*, performed at the Norwich Theatre in 1820, and in London in 1821-22. This was followed, in 1822, by an adaptation of *The Fortunes of Nigel*, and an original drama entitled *Joan of Arc*. For the next twenty-five years Fitzball was the most prolific dramatic author in England, turning out an enormous number of comedies, tragedies, and melodramas, most of which were written to order for the managers of various metropolitan theatres. He was attached in succession to the Adelphi, Covent Garden, and Drury Lane theatres, as a stock dramatist. Among his numerous successes were: *Peveril of the Peak* (1823); *Waverly* (1824); *The Floating Beacon* (1824); *The Pilot* (1825), an adaptation of Cooper's novel, which ran over 200 nights; *The Flying Dutchman* (1828); *The Red Rover* (1828); *The Devil's Elixir* (1830); *Hofer, the Tell of the Tyrol* (1832); *Jonathan Bradford* (1833), a melodrama which ran over 400 nights at Covent Garden; *Tom Cringle* (1834); *Walter Tyrell* (1835); *Zazezizozu* (1836); *The Momentous Question; The Miller of Derwentwater;* and *Nitocris* (1859). Besides numerous popular ballads and songs he wrote the librettos for Balfe's operas, *The Siege of Rochelle* (1835); *Joan of Arc; Diadeste; Keolanthe* (1840); and *The Maid of Honor* (1847); for Donizetti's *La Favorita;* for Bishop's *Adelaide;* and Wallace's *Maritana*. He published his memoirs under the title, *Thirty-five Years of a Dramatic Author's Life* (1859).

FITZDOT′TREL. A gull in Jonson's *The Devil is an Ass*. He is a conceited country squire who pretends to be something other than himself for purposes of deceit.

FITZGER′ALD, Lord Edward (1763-98). An Irish politician and revolutionist. The fifth son of the seventeen children of the first Duke of Leinster, he was born October 15, 1763, at Carton Castle, near Dublin, and educated in France. Fitzgerald joined the English Army, and in 1781 went to the United States. He was wounded at the battle of Eutaw Springs. In 1783 he returned to Ireland to represent Athy in the Irish Parliament. A taste for exploration afterwards led him to journey by compass through the woods from Fredericton to Detroit, where he was formally admitted into the Bear tribe. He also went down the Mississippi to New Orleans. In 1790 he returned and sat in the Irish Parliament as member for Kildare. Attracted by the French Revolution, he visited Paris in 1792, and was cashiered from the English Army for attending a revolutionary banquet at which he expressed republican sympathies and renounced his title of nobility. During this visit he married the putative daughter of Philippe 'Egalité,' Duke of Orleans, and Madame Genlis, the celebrated Pamela, who was afterwards discovered to be the child of Mary Sims, of Newfoundland, by De Brixey, a French captain. They returned to Ireland and lived at Kildare, the union proving particularly happy. His sympathies with the struggles of his countrymen led him to join the United Irishmen in 1796, and he went to France to arrange, with the Directory, an invasion to support an Irish revolution. Soon after his return the plot became known to the English Government, and Fitzgerald, after a desperate resistance, during which he was severely wounded, was captured and died in prison on June 4, 1798. His widow married Mr. Pitcairn, American Consul at Hamburg, but soon separated from him, and after a checkered existence, died in poverty in Paris in 1831. Consult Moore, *Life and Death of Edward Fitzgerald* (2d ed., London, 1875).

FITZGERALD, Edward (1809-83). An English poet, whose exceptional qualities were obscured by an equally exceptional modesty, and whose fame is due almost wholly to his translation, from the Persian, of the *Rubáiyát* of Omar Khayyám. Although of Irish ancestry, he was born at Bredfield House, near the market town of Woodbridge, in Suffolk; and it was here that he elected to spend his life in strict seclusion—almost a hermit's life in its sequestered tranquillity and remoteness from the outside world. The family name was Purcell, but on his grandfather Fitzgerald's death (1818), his father took the arms and the name of his wife. He was educated at Trinity College, Cambridge, taking his degree in 1830, and there formed lifelong friendships with men since famous, among others Spedding and Thackeray. With the Tennysons he did not become intimate until later. A good picture of Fitzgerald's academic life is preserved in *Euphranor*, his earliest printed work—a sort of Platonic dialogue, in which the speakers are thinly disguised under symbolic or classical names; and his lasting fondness for Cambridge is proved by the occasional visits he made down to his closing years. His brief experience of married life resulted unhappily. His wife was Lucy, daughter of Bernard Barton, the Quaker poet of Woodbridge, and one of Fitzgerald's closest friends. But he was temperamentally unfitted for matrimony, and they soon separated by mutual consent. Henceforth he contended himself with the companionship of his books and the luxury of a few chosen friendships. His simple life was varied by occasionally "pottering about the midland counties of England," or taking short coasting trips in his own yacht. A typical summer is described in his own words, as follows: "A little Bedfordshire—a little Northamptonshire—a little more folding of the hands—the same faces—the same fields—the same thoughts occurring at the same turns of road—this is all I have to tell of; nothing at all added—but the summer gone."

In literature, as in other things, Fitzgerald was an epicure. He read slowly and of none but the best. Sophocles and Tacitus, Homer and Shakespeare were the authors that he lived with. The Greek Anthology occupied him an entire season. Probably no writer who took the trouble to publish his writings has ever been so indifferent to their fate as Fitzgerald. Just what first awoke him from his dreams among his turnips and spurred him on to authorship is not clear. In 1846 Carlyle and Professor Cowell, the Orientalist, became factors of importance in his life, and it may have been in a measure due to such mental stimulus that five years later *Euphranor* was published—anonymously, as with one exception were all his writings. A year later appeared *Polonius*, a collection of wise saws gathered from his favorite books and interesting to-day chiefly for its graceful preface. In 1853, the first of his famous translations appeared, *Six Dramas of Calderon*, with his own name appended; but an attack by an undiscriminating and unknown reviewer in the *Athenæum* effectually dampened his brief desire for personal glory; and neither the praise of men like Carlyle, Thackeray, and James Russell Lowell, nor the Calderon medal sent, he "doubts not, at Mr. Lowell's instance," could tempt him to write again under his own signature. Fitzgerald's intimacy with Professor Cowell, which had ripened while they read together the plays of Calderon, culminated in their study of the Persian poets, and bore important fruit in Fitzgerald's translation of the *Salámán and Absál*, of Jámi, in 1856, and the *Rubáiyát* three years later. The story of how the now famous quatrains first claimed public attention is well known. Fitzgerald offered some of "the less wicked" of them to *Frazer's Magazine;* but as they failed to appear, he made a present of them, two years later, to his publisher, Mr. Quaritch, who issued them in a brown-covered pamphlet, at five shillings. In course of time they found their way to a penny box outside the bookseller's door. It was there that Mr. Whiteley Stokes bought the copy which he gave to Dante Gabriel Rossetti, who in turn passed it on to Mr. Swinburne, and thus laid the foundation of the Omar cult in England.

Only once after this did Fitzgerald arouse himself to activity—in the winter of 1864-65, when he published two more Calderon plays and his version of the *Agamemnon*. Each year his life grew quieter; his days were spent "in boat or vessel as in a moving chair, dispensing a little grog and shag to those who do the work." There is less and less of literature in his correspondence. New books did not appeal to him, and he could see little merit in Emerson, George Eliot, or Victor Hugo. His old books continued to suffice; and the only new taste that he formed late in life was for the poems of Crabbe. And by a curious coincidence, he died while on a visit to the home of the Rev. George Crabbe, a grandson of the poet.

Whatever merit Fitzgerald's other writings possess, there is no question that they are quite eclipsed by his famous rendering of the *Rubáiyát*. As an instance of the deliberate transplanting of a poet from one nation to another widely separated by language and ideals and the lapse of centuries, and of having that poet take fresh root and flourish with renewed life, the *Rubáiyát* stands unique. Fitzgerald's theory of translation was peculiar. He took great liberties with the original, aiming less to reproduce the exact thought than the atmosphere, and boldly rejecting whatever, through difference of social or artistic standards, might tend to arouse in Anglo-Saxon minds thoughts alien to the intention of the poet. Omar Khayyám, almost unknown to

European scholars until transmuted by the magic of Fitzgerald's genius, is now probably the most familiar of all Persian poets to the Western world. Versions, in both prose and verse, have multiplied rapidly, many of them far more faithful to the original than Fitzgerald's version; and wonder is sometimes expressed that none of these attains a similar popularity. It is only just beginning to be recognized that Fitzgerald's *Rubáiyát* is held in honor, not as Persian, but as English poetry, and that to the great majority the sources are as unimportant as the sources of a play of Shakespeare. Whatever inspired him, the result is here—a piece of exquisite workmanship, "coral-building in literature," as Edmund Gosse has defined it. The scrupulous care, the loving revision and endless polishing which finally resulted in the *Rubáiyát* as it stands to-day can be understood only by a comparison of the texts in the successive editions. The result is a rare delicacy of phrase, a fine instinct for the one appropriate word that distinguished Fitzgerald among the poets of his time and country.

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FITZGERALD, GEORGE FRANCIS (1851—). An English scientist, born at Dublin, Ireland, a son of Bishop William Fitzgerald. He was educated at Trinity College, Dublin, and became professor of natural and experimental philosophy at the university in that city. In 1888 he was appointed president of Section A of the British Association at Bath, and examiner to the London University. Among his numerous publications may be mentioned: "On the Possibility of Originating Wave Disturbance in the Ether by Means of Electric Forces," in the *Transactions of the Royal Dublin Society*, vol. i.; *On an Analogy Between Electric and Thermal Phenomena* (1884); *On the Limits to the Velocity of Motion in the Working Parts of Engines* (1886).

FITZGERALD, JAMES NEWBURY (1837—). An American ecclesiastic, born at Newark, N. J. He was admitted to the State bar of New Jersey in 1858, and was ordained to the ministry of the Methodist Episcopal Church in the Newark Conference in 1862. From 1880 to 1888 he was recording secretary of the missionary society of the Church, and in the latter year was appointed bishop.

FITZGERALD, JOHN DAVID (1816-89). An Irish jurist, born in Dublin, and educated there at Trinity College. He was called to the bar in 1838, and was elected to Parliament in 1852 as representative for Ennis. When the first Palmerston Ministry was formed three years later, he was made Solicitor-General for Ireland, and in 1856 became Attorney-General. During the same year he was made a member of the Irish Privy Council. In 1860 he left Parliament and was appointed a judge of the Queen's Bench in Ireland. He was appointed a lord of appeal, with a life peerage, in 1882, and at the same time received a position in the English Privy Council. He showed marked knowledge and ability in the House of Lords in his debates upon Irish questions, and his services on the judicial committee of the Privy Council were equally eminent. Many important charges were brought before him while upon the Queen's Bench in Ireland, including the cases of the Fenian conspirators in 1865-66, of Sullivan and Pigott for seditious libel in 1868, and of Parnell in 1880-81.

FITZGERALD, OSCAR PENN (1829—). An American ecclesiastic, born in North Carolina. After learning the printer's trade, he entered the ministry of the Methodist Episcopal Church in 1853. From 1867 to 1871 he was State Superintendent of Public Instruction for California and editor of the *California School Journal*, and for some time edited the *Christian Spectator* and *Pacific Methodist*. In 1878 he became editor of the *Nashville Christian Advocate*, and in 1890 a bishop of the Methodist Episcopal Church, South. His publications include: *California Sketches* (1879-81); *Centenary Cameos* (1884); *The Day and the Lord* (1898); and *Sunset Views* (1900).

FITZGERALD, PERCY HETHRINGTON (1834—). A British author and critic. He was born at Fane Valley, County Louth, Ireland, and was educated at Stonyhurst College, Lancashire, and at Trinity College, Dublin. He was called to the Irish bar, and was for a time Crown prosecutor on the northeastern circuit. Coming to London, however, he became a contributor of fiction to Charles Dickens's magazine, *Household Words*. In the long list of Mr. Fitzgerald's subsequent writings are numerous biographies and works relating to the history of the theatre; among them are the *Life of Sterne* (1864); *Charles Lamb* (1866); *Life of David Garrick* (1868); *Life of George IV.* (1881); *Life of William IV.* (1884); *Lives of the Sheridans* (1886); *Henry Irving: A Record of Twenty Years at the Lyceum* (1893); *The Romance of the English Stage* (1874); and *A New History of the English Stage* (1882). With W. G. Wills he wrote *Vanderdecken*, which was brought out by Irving at the Lyceum. Consult his *Memoirs of an Author* (London, 1895).

FITZGERALD, THOMAS (1796-1855). An American lawyer and politician, born at Germantown (Herkimer County), N. Y. He served under Gen. W. H. Harrison in the War of 1812, was admitted to the New York bar, and removed to Indiana, where he became a member of the State Legislature, and thence to Michigan. In 1848-49 he represented Michigan in the United States Senate, filling the vacancy which resulted through the resignation from office of Gen. Lewis Cass. He was subsequently prominent in the councils of the Democratic Party in Michigan. As a commissioner for the investigation of the so-called 'wild-cat' banks, he greatly contributed toward their final eradication. In 1837 he became a regent of the University of Michigan.

FITZGERALD, THOMAS, Lord OFFALY, tenth Earl of Kildare (1513-1537). A vice-deputy of Ireland who acted for his father, Gerald, ninth Earl of Kildare, when he was summoned to London in 1534 to answer charges of maladministration as lord deputy. A rumor that his father had been executed in the Tower, and that the death of his uncles and himself had been determined upon, made him renounce his allegiance and declare war on the Government. His first successes were tarnished by the murder of Archbishop Allen, and sentence of excommunication was passed upon him. He besieged Dublin Castle, but had to retire, and Sir William Skeffington crushed the rebellion by capturing Maynooth, the stronghold of the Geraldines, in March, 1535. Fitzgerald's father had been attainted and died in the Tower from the effects of an old bullet wound, but not before he had heard of and expressed gratification at his son's rebellion. Lord Thomas, after leading a wandering life for some months with a price set upon his head, surrendered to Lord Leonard Grey, and was sent to England. He was committed to the Tower, with his five uncles, and although three of them had taken no part in the rebellion, the six Geraldines were drawn, hanged, and quartered at Tyburn, February 3, 1537. Restitution of the family estates was made by Edward VI., and Queen Elizabeth repealed the bill of attainder.

FITZGIB′BON, JOHN, Earl of Clare (1749-1802). An Irish statesman. He was born near Donnybrook, and was educated at Trinity College, Dublin, and Christ Church, Oxford. He entered the bar in his native land in 1772; eleven years afterwards was Attorney-General, then member of Parliament for Dublin University, then Lord Chancellor (1789), and a peer of Great Britain (1799). He is chiefly remembered for being the strongest personality among those who labored for the union of Ireland with England, and this fact, joined to his persistence in exerting his weighty influence against the Roman Catholics, has caused his name to be execrated by the most of his countrymen. On the other hand, he had friends of his own party and religion who balanced his severity with his sincerity, his insolence and bad temper with his bravery and ability, his vanity and ambition with his undoubted private virtues.

FITZHER′BERT, ALLEYNE, Baron Saint Helens (1753-1839). An English diplomat, son of William Fitzherbert and of Mary Meynell, both friends of Dr. Johnson. He was educated at Derby and Eton, and at Saint John's, Cambridge, where he got his degree in 1774. In 1777 he was made Minister to Brussels, and five years later he was sent to Paris to effect a treaty with France, Spain, and the United Provinces. He probably took a large part, as well, in the negotiations which led up to the peace with America. In 1783 he was sent to Russia and accompanied the Empress Catharine on her trip through the Crimea in 1787. At the end of this year he became first secretary to the new Lord Lieutenant of Ireland, the Marquis of Buckingham. He held this post until the spring of 1789, when he went to The Hague as Envoy Extraordinary. Two years later he was sent to Madrid to settle the question of the Southern whale fishery; and in 1794 was reappointed to The Hague, now as Ambassador. In 1801 he went on his last mission, to attend the coronation at Moscow, and concluded a treaty with Russia and an agreement with Denmark and with Sweden. He received the title of Saint Helens in 1791, was pensioned in 1803, and lived his last years in London. He was not married. His oldest brother, Sir WILLIAM (1748-91), was also a favorite of George III., but resigned his post as gentleman usher after a quarrel with the Marquis of Salisbury.

FITZHERBERT, Sir ANTHONY (1470-1538). An English jurist, born in Derbyshire. He was educated at Oxford and Gray's Inn, was sergeant-at-law to Henry VIII. (1516), became a judge, was knighted, and in 1524 was one of the peace commissioners to Ireland. Fitzherbert signed Wolsey's impeachment (1529), defended the second royal marriage, and was one of the judges in the More and Fisher trials. He reached his literary high-water mark with his first book, *La Graunde Abridgement* (1514), but has left also a number of legal works characterized by clearness of reasoning and a comprehensive grasp of his subject.

FITZHERBERT, MARIA ANNE (SMYTHE) (1756-1837). The unacknowledged wife of George IV. of England. She was born on the estate of her father at Brambridge, Hampshire, and in 1775 married Edward Weed, who died in the same year. In 1778 she married Thomas Fitzherbert, who died in 1781. She first met Prince George of Wales, who was six years her junior, in 1785. The Prince fell in love with her on sight, but she refused to accept his attentions, and spent some months on the Continent to escape them. In December, however, she returned to England, and was married to him on the 21st of the month. The marriage was never either publicly avowed or disavowed by George, but it was known to both that under the Marriage Act of 1772 any marriage contracted by a member of the royal family under twenty-five years of age, without the King's consent, was invalid. The alliance was further complicated by the fact that Mrs. Fitzherbert was a Roman Catholic, and by the Act of Settlement, if the heir apparent married a member of that Church, he forfeited his right of succession. There was a general understanding that a marriage had taken place, however, and she was received by the best society and by members of the royal family, and was treated by Prince George as his wife. She was a woman of high character, and after his marriage to Caroline she ceased for a time to live with him, but after some months the connection was resumed, and continued until 1803, when it was finally terminated at her desire. Consult Langdale, *Life of Mrs. Fitzherbert* (London, 1856).

FITZHUGH′, GEORGE (1802-81). An American sociological and political writer. He was born in Prince William County, Va. Self-educated, he practiced law and began to write in defense of slaves, both in newspapers and in *De Bow's Review*. His remarkable philosophy of slavery, which was probably more extreme than that of any other Southerner, controverting all the principles of the Founders, including Jefferson, and expressed in a powerful way, was presented in *Sociology for the South, or the Failure of Free Society* (1854), and *Cannibals All, or Slaves Without Masters* (1856). He died at Huntsville, Tex.

FITZINGER, fĭts′ĭng-ēr, LEOPOLD JOSEPH (1802-84). An Austrian zoölogist, born in Vienna. In 1826 he published the work entitled, *Neue Klassifikation der Reptilien nach ihren natürlichen Verwandtschaften,* which necessitated a complete remodeling of the system of Brongniart. He was appointed director of the Zoölogical Garden at Munich in 1863, and in 1865 he was called in the same capacity to Pesth, where he continued to reside until 1873.

FITZ-JAMES, fĭts-jāmz′, JAMES (1670-1734). See BERWICK, JAMES FITZ-JAMES, DUKE OF.

FITZMAU′RICE, Lord EDMOND GEORGE (1846—). An English diplomat. He was born in London, a son of the fourth Marquis of Lansdowne and of Emilie de Flahaut, and was educated at Eton and at Trinity College, Cambridge. He represented Calne in the House of Commons (1869-85), and was returned again in 1898. In 1880 he was made a commissioner for the reorganization of the Turkish provinces and Crete under the Treaty of Berlin; was second Plenipotentiary at the Danube Conference (1882-83); and succeeded Sir Charles Dilke as Under-Secretary of State in the Foreign Ministry. He allied himself with the Liberal Party, and distinguished himself as a writer on foreign politics. He wrote a *Life of Lord Shelburne* (1875-77), and *Sir William Petty, the Political Economist* (1895).

FITZMAURICE, PETTY. See LANSDOWNE.

FITZPAT′RICK, BENJAMIN (1802-69). An American lawyer and politician. He was born in Georgia, but settled in Montgomery, Ala., where he made a reputation as a lawyer, and became known as a man of exceptional integrity in public affairs. In 1840 he was a candidate for Presidential elector on the Democratic ticket, and was an active worker for Martin Van Buren. He was elected Governor of Alabama in 1841, and was United States Senator from 1849 to 1861, for part of which time he presided over the Senate as president *pro tem.* In 1860 he was nominated for Vice-President on the ticket with Douglas, but declined to run. When Alabama adopted her ordinance of secession in 1861, he retired from the Senate, but took no active part in Confederate affairs. He was president of the Alabama Constitutional Convention of 1865.

FITZPATRICK, CHARLES (1853—). A Canadian lawyer and politician. He was born in Quebec, graduated in 1873 at Laval University, in 1876 was admitted to the bar of Quebec, and in 1879 and again in 1887 was appointed Crown prosecutor for Quebec city and district. In 1885 he was leading counsel for Louis Riel, who was tried and executed for high treason. From 1890 to 1896 he represented Quebec County as a Liberal member of the Quebec Assembly, and in the latter year was elected from Quebec County to the Dominion Parliament. In the same year he was also appointed Solicitor-General in Sir Wilfrid Laurier's Ministry. His legal practice soon became very extensive. He has been regarded as a prominent representative of the Irish Catholic element in Canada.

FITZPATRICK, RICHARD (1747-1813). An English soldier and politician. He was educated at Westminster School, and there began his acquaintance with Charles James Fox, who continued to be his intimate friend and companion, and became, with him, a leader of fashion. In 1765 he was appointed an ensign in the First Regiment of Guards. Fitzpatrick was induced to enter politics, and in 1774 was elected to the House of Commons. He was opposed to the war with the American colonies, but went to America when he was ordered, fought at Brandywine and Germantown, and returned to England in 1778. In 1782 he was first secretary to the Duke of Portland, Lord Lieutenant of Ireland. A year later he became Secretary of War in the Ministry of Fox and North. But he was more noted as a wit and a beau, a gentleman of polished manners and courtly address, than as a politician. In 1796 he made a famous speech against Lafayette's imprisonment by the Austrians. He was made lieutenant-general in 1798, general in 1803, and was again Secretary of War in 1806. After Pitt's death, Fitzpatrick, though still in Parliament, took little interest in politics.

FITZPATRICK, WILLIAM JOHN (1830—). An Irish author, born in Dublin. He was educated at the Catholic College in Congglowes Wood, and at the University of Dublin. In 1876 he was appointed professor of history at the Royal Hibernian Academy. His works, chiefly biographical, include: *The Life, Times, and Correspondence of Dr. Doyle, Bishop of Kildare* (2d ed. 1880); *Irish Wits and Worthies* (1873); *Life of Charles Lever* (1879); *Life of Thomas N. Burke* (1886); *Daniel O'Connell, the Liberator: His Letters and Correspondence* (1888).

FITZRALPH′, RICHARD (?-1360). An English prelate, champion of the secular clergy against the mendicant friars. He was born at Dundalk, County Louth, Ireland, and educated at Oxford, where he became fellow of Balliol College, and chancellor in 1333. The following year he was made chancellor of Lincoln Cathedral, a little later Archdeacon of Chester, in 1337 Dean of Lichfield, and in 1347 Archbishop of Armagh. He seems to have been a frequent and welcome visitor at the Papal Court at Avignon, and met there in 1349 a delegation from the Armenians, who had applied to the Pope for aid against the Mohammedans. The Pope had required as a condition preliminary to giving his help that they abjure the 117 heresies with which they were charged, and the delegation was sent for consultation. Fitzralph took part in the negotiations and prepared an elaborate treatise, *Summa in Quæstionibus Armeniorum* (printed at Paris, 1511), which was believed to refute all the Armenian heresies. He also presented to the Pope at this time a petition from the secular clergy of England against the mendicant friars, and was appointed to look into the matter. Returning to Ireland after 1350, he came out boldly against the friars. Between 1350 and 1356 he prepared and published a treatise on the questions at issue, *De Pauperie Salvatoris,* in seven books. In 1356 he preached so pointedly against the friars in London that they had him cited to defend himself before the Pope. He went to Avignon and preached there, before Innocent VI., a famous sermon, "Defensio Curatorum" (printed in Goldfast's *Monarchia*). He died at Avignon, November 16, 1360, before the decision of the examiners was announced. In 1370 his bones were removed from Avignon to Dundalk and pilgrimages were made to his tomb. Fitzralph was a popular preacher, and many of his sermons exist in manuscript. Consult Poole's edition of Wiclif's *De Dominio Divino* (Wyclif Society, London, 1890), where the first four books of the *De Pauperie Salvatoris* are reprinted.

FITZROY′. The name of two Australian rivers. (1) The Western Australian river of this name rises in the King Leopold Mountains, and after a westerly course of 300 miles through fertile, grass-covered plains, turns to the northwest, emptying into King Sound, on the Indian Ocean (Map: Australia, C 2). It was discovered in 1838 by Stokes. It is navigable for 100 miles. (2) The Queensland river is formed by the junction of the Mackenzie and the Dawson (Map: Australia, H 3). It flows east into Keppel Bay, on the Pacific coast, near the Tropic of Capricorn. Ships of 1500 tons ascend to Rockhampton, 35 miles from its mouth.

FITZROY. See GRAFTON, DUKES OF.

FITZROY, ROBERT (1805-65). A British naval officer. He was born at Suffolk, studied at the Royal Naval College, and entered the British Navy in 1819. In 1828 he was given command of the *Beagle,* employed in surveying the southern coast of South America under the orders of Captain King of the *Adventure,* and two years later went with Darwin on another expedition to South America. From 1843 to 1845 he was Governor and Commander-in-Chief of New Zealand. In 1854 he became chief of the meteorological department of the Board of Trade. His *Weather Book* (1863) was a valuable contribution to the science of meteorology, and he instituted a system of storm warnings which has gradually developed into the one now in use. He committed suicide in 1865. He published: *Narrative of the Surveying Voyages of H. M. Ships Adventurer and Beagle* (3 vols., 1839), the third volume of which is by Darwin; *Remarks on New Zealand* (1846); *Barometer and Weather Guide* (1858); and *Barometer Manual* (1861).

FITZSIM′ON, HENRY (1566-1643). An Irish Jesuit and author. He was born in Dublin, and was educated at Manchester, Oxford, Paris, and Rome. In 1592 he joined the Order of Jesuits and was shortly afterwards made professor of philosophy in the Douai University. He did missionary work in Ireland (1597-99) upon a large scale, for which he was arrested and imprisoned in Dublin Castle for five years. Released by order of James I., he went to Spain and then to Flanders, whence he visited Rome. After serving for some time as an army chaplain, he returned to his native land in 1630, but lived in constant dread of arrest on account of his share in the rebellion. His voluminous writings are chiefly controversial in character, upholding the Roman Catholic against the Protestant faith.

FITZWAL′TER, ROBERT (?-1235). An English baron, keeper of Hertford Castle. From a supporter, he became the leading opponent of King John, who, in fear and hatred, banished him and plundered his estates (1213). Forced to recall him, John fought valiantly against the demands of Fitzwalter and his brother barons, but was eventually compelled by them to sign the Magna Charta. As one of the executors thereof, Fitzwalter lived in terror of his life, was excommunicated, but bravely battled against the royal party on behalf of popular rights, even seeking aid from France. The help received proved to be a hindrance, after the death of King John; but Fitzwalter continued his fight for freedom, and though personally unfortunate, his party gained the day. In 1219 he turned Crusader for a year or two, but being by this time an old man, he retired to England and found favor with Henry III.

FITZWIL′LIAM MUSEUM, THE. A museum at Cambridge University, founded by Viscount Fitzwilliam in 1816. It has a fine collection of books, manuscripts, paintings, and engravings left it by its founder. Among the painters represented in the collection are Holbein, Dürer, Titian, Paul Veronese, Hogarth, and Turner. Rembrandt's "Officer" hangs in its west gallery. The building itself is a fine example of Grecian architecture. An archæological museum is annexed to it, containing 600 casts from antique statues.

FIUME, fyōō′me. A royal free town and the seaport of Hungary, forming, together with its adjoining territory, since 1870, a political division of the kingdom (Map: Hungary, D 4). It is picturesquely situated at the head of the Bay of Quarnero, an inlet of the Adriatic, and is about 40 miles southeast of Triest. The views of the bay and town are beautiful, and the environs are attractive. Fiume consists of the old town built on a hill, with crooked narrow streets, and the new town stretching along the shore, with fine broad streets, handsome squares, and numerous elegant public buildings. The public garden is particularly worthy of mention. Among the edifices the most interesting are the ancient cathedral, with a façade in the style of the Pantheon at Rome; the Church of Saint Vitus, a copy of Santa Maria della Salute at Venice; the town hall, the Government buildings, the Naval Academy, and the municipal theatre. There is a Roman triumphal arch, supposed to have been erected to Emperor Claudius II. Gothicus. Fiume has three harbors, the largest, begun in 1872, being capable of accommodating 150 large vessels. It is protected by a breakwater 3250 feet in length, and flanked by a quay nearly two miles long. The entire port is lighted by electricity.

The city, owing to the active interest shown by Hungary in this its only seaport, has an extensive and steadily increasing commerce. In 1900, 21,471 ships entered and cleared the port with a tonnage of 3,365,480 tons. In 1898 Fiume's commercial fleet comprised 189 vessels. The chief articles of import are wine, rice, tobacco, and raw jute; of export, flour, sugar, and lumber. The total value of the commerce for 1899 amounted to $43,000,000, as against less than $6,000,000 in 1871. The manufactures of Fiume are likewise flourishing. The chief industrial establishments are the Government tobacco factory, employing over 2000 persons, the large Whitehead torpedo-works, an enormous petroleum refinery, a rice-shelling factory, an extensive paper-mill, and a number of sawmills. The fisheries are important, those of tunny being especially rich. Fiume is fully equipped with banks, commercial unions, and industrial associations. It is administered by a separate Governor, who is a member of the Upper House of the Hungarian Parliament. The town sends four representatives to the Lower House of the Kingdom, and is entitled to two representatives in the Diet of Croatia and Slavonia. The chief educational institutions are the Naval Academy, a royal gymnasium, and two high schools. There is a United States consul. Population, in 1890, 29,494; in 1900, 38,139, for the most part Roman Catholics. The inhabitants are chiefly Italians and Illyrians. Fiume was a town of the Byzantine Empire. In the ninth century it was ruled by its own dukes. In 1471 it came into the possession of Austria, and in 1779 was attached to the Crown of Hungary.

FIVE BOROUGHS, The. A term applied in old English history to Leicester, Lincoln, Nottingham, Stamford, and Derby, which the Danes held until 922, when they were reconquered together by Edward and Ethelfleda.

FIVE-FINGERS. See Starfish.

FIVE FORKS, Battle of. A battle fought, on April 1, 1865, in Dinwiddie County, Va., 11 miles southwest of Petersburg, between a Federal force of about 25,000 under General Sheridan and a smaller Confederate force under General Pickett. Both Grant and Lee had perceived the importance of the Forks as a position from which to assail or to protect the Southside and Danville railroads, the two lines still open to Lee; and as part of his general movement by the left flank, Grant sent Sheridan's cavalry, afterwards reinforced by the Fifth Corps under General Warren, to capture or drive away the Confederates stationed there. Lee, meanwhile, had sent forward a Confederate reinforcement of five brigades under Pickett. On March 31 Sheridan made an unsuccessful attack, but on the following day, reinforced by Warren's infantry, completely defeated the Confederates after a bloody fight lasting, with little intermission, throughout the day. The exact losses on either side were never ascertained, but the Confederates seem to have lost more than 5000 in prisoners alone, while the Federals lost fewer than 1000 in killed and wounded. Lee was forced to evacuate Petersburg on the morning of the 3d, and six days later surrendered his army at Appomattox. Consult: Johnson and Buel (editors), *Battles and Leaders of the Civil War* (New York, 1887); Humphreys, *The Virginia Campaign of 1864 and 1865* (New York, 1883); Sheridan, *Memoirs* (New York, 1888); and *Official Records of the Union and Confederate Armies*, Series I., vol. xlvi.

FIVE HUNDRED, Council of (Fr. *Conseil des Cinq Cents*). The Lower House of the Legislature established by the French Constitution of the year III. (1795). The Constitution provided that two-thirds of the original body should be made up of members of the Convention. The Five Hundred initiated and discussed all legislation, without taking action, and then submitted their report to the Upper House, or Council of Ancients, which acted without discussion. On the 19th Brumaire, Year VII. (November 10, 1799), Napoleon dissolved the Five Hundred. See Directory; France; Napoleon I.

FIVE ISLANDS. A town of Colchester County, Nova Scotia, Canada, on Minas Basin, 60 miles northwest of Halifax. It has shipbuilding and mineral industries. Amid its picturesque scenery is a cataract falling from a height of 90 feet. Estimated population, 1500.

FIVE MEMBERS, The. After the presentation of the Grand Remonstrance (q.v.), Charles I. resolved to take vengeance on the leaders of the Parliamentary opposition. The bold course subsequently taken by them, notably the impeachment of the bishops and the supposed intention to impeach the Queen, fixed him in this unlucky resolve. On January 3, 1642, he sent his Attorney-General, Sir Edward Herbert, before the Lords to impeach Lord Kimbolton, and five members of the Commons—Hampden, Pym, Holles, Strode, and Sir Arthur Haselrig. This procedure was unprecedented. The Lords appointed a committee to inquire whether it was according to law, and the Commons appealed to the city of London to have the trained bands in readiness. The sergeant-at-arms failed to secure the arrest of the accused members, and the impatient King himself undertook to take them by force. On January 4th, Charles, urged on by his Queen, appeared with an armed retinue in the House of Commons, and desired the Speaker to point out the culprits; but the impeached members had taken refuge in the city, whither they were soon followed by other members, who sat as a committee in the Guildhall. For the articles of impeachment presented to the Lords, consult: Gardiner, *Constitutional Documents* (2d ed., Oxford, 1899); and for discussion, id., *History of England* (New York, 1893-95), and Forster, *Arrest of the Five Members* (London, 1860).

FIVE-MILE ACT. An act passed by the English Parliament in 1665. It forbade nonconformist ministers who refused to take the nonresistance oath to come within five miles of any corporation where they had preached since the Act of Oblivion (unless they were traveling), under a penalty of £40. The act was not repealed till 1689.

FIVE NATIONS. See Iroquois.

FIVE POINTS. A locality of New York City, northeast of the city hall, formed by the intersection of Baxter, Worth, and Park streets, formerly notorious as the haunt of low characters and criminals. Improvements have completely altered the general aspect of the old Five Points; yet the streets of the vicinity still have features of considerable interest in the distinct settlements of Jews, Italians, and Chinese.

FIVE POINTS OF DOCTRINE. The topics in dispute between Calvinists and Arminians—viz. predestination, extent of the atonement, free will, grace, and final perseverance. Among the ineffectual attempts to settle the dispute were the quinquarticular controversy at Cambridge in 1594 and two conferences in 1626, in England, and the Synod of Dort in Holland, 1618-19. See Arminianism; Dort, Synod of.

FIVES. See Handball.

FIXED AMMUNITION. See Ammunition.

FIXED OILS. Oils which do not volatilize without decomposition. See Oils.

FIXING. The process in photography by means of which those portions of the sensitive silver salts that remain unaffected by light in the deepest shadow of the picture after the negative has been exposed are removed. The picture which remains is then permanently 'fixed' on the negative, and consists of metallic silver or silver oxide, to which the sensitive salt has been reduced by the action of the sun's light. Fixing is generally accomplished by sodium hyposulphate or potassium cyanide. The action of these substances depends upon the formation of double salts of silver with the alkali metals; these are soluble in water, and are therefore readily washed away from the negative. In the daguerreotype process the picture was originally fixed on the silver plate by means of a boiling solution of gold and sodium hyposulphite, called *sel d'or*. See PHOTOGRAPHY.

FIXTURES (from *fix*, Fr. *fixer*, from ML. *fixare*, to fasten, frequentative of Lat. *figere*, to fasten). In English and American law, chattels which are so annexed or attached to the soil as to become, in legal contemplation, a part thereof. The term land, in our legal system, comprehends not only the earth, but all the material improvements, such as houses, fences, and the like, which are permanently affixed thereto; and chattels which become so annexed lose their identity as chattels, and their character of personal property, and become land and real property. The general rule as to what constitutes a fixture legally immovable is, that it must be either let into the earth, or cemented or otherwise united to some erection previously attached to the ground, so that it would be waste to remove it afterwards. But it must be remarked that a tenant may in all cases construct any erection he may make in such a manner as that it shall not become a fixture. Thus, if he erect even buildings—as barns, granaries, sheds, and mills—upon blocks, rollers, patterns, pillars, or plates, resting on brickwork, they may be removed although they have sunk into the ground by their own weight. But the mode of annexation to the freehold is not always conclusive as to its legal effect, as an article like a picture or chandelier may be secured to the wall or ceiling of a room by screws or otherwise for a merely temporary purpose without becoming a fixture, and, on the other hand, a heavy object, as a statue or monument, resting upon the ground of its own weight, but intended for the permanent improvement of the premises, may become a part of the freehold.

In general, however, there must be an actual annexation to the soil, and where that exists the article annexed becomes a fixture irrespective of the motive with which it was affixed. To this rule various exceptions have been made in favor of what have been called trade fixtures, or fixtures erected by a tenant for life or for years for the purpose of carrying on a trade, and this principle has been extended by the courts to a variety of ornamental and domestic fixtures added to the premises by such a tenant. The exception does not go to the length of holding that such articles do not acquire the character of fixtures, but merely permits their removal by the tenant at or before the end of his term. If the removal be delayed beyond that time, the right is lost, and, generally, the same result follows the taking of a new lease by the tenant without reserving such right of removal. In the case of a life tenant, such fixtures may be removed by his executor within a reasonable time after the tenant's death. It is difficult to state the limits of this exception with reference to trade fixtures with any approach to accuracy. The following is perhaps as near an approach as the varying circumstances of each individual case will admit of: "Whenever the following circumstances occur, it may be confidently pronounced that there the tenant may safely remove the article. Thus, things which the tenant has fixed to the freehold for the purposes of trade or manufacture may be taken away by him whenever the removal is not contrary to any prevailing practice; where the articles can be removed without causing material injury to the estate, and where of themselves they were of a perfect chattel nature before they were put up, or at least have in substance that character independently of their union with the soil—or, in other words, where they may be removed without being entirely demolished, or losing their essential character or value." Nurserymen have been allowed to remove trees and shrubs which they have planted expressly for purposes of sale, but not to plow up strawberry beds, out of the ordinary course of management of the nursery ground.

While in the United States the law governing the annexation and removal of fixtures is in general the same as in England, certain minor details have been worked out to different results. For instance, the English discrimination against buildings for agricultural purposes has been generally disregarded in the United States. It must be remarked also that the rule is different as between different parties. As between landlord and tenant the rule favors the tenant. As between grantor and grantee, and mortgagor and mortgagee, the tendency is to consider doubtful articles as fixtures. So as between heir and executor, the basis of the rule is that the intention of the person making the attachment shall be considered in doubtful cases; and that generally where removal would cause an injury to the freehold a permanent fixture will be presumed to have been intended.

An interesting question in regard to the rolling stock of railroads has received much attention from the courts. The results reached have been diametrically opposite in different States, some courts holding that the rolling stock is not a part of the road proper, and would not be covered by a general mortgage of the real estate, and other tribunals deciding, on a similar state of facts, that the rolling stock would form a part of the realty. The former view is the prevailing one. See LANDLORD AND TENANT; REAL PROPERTY, and the authorities there referred to.

FIZEAU, fē'zō', ARMAND HIPPOLYTE LOUIS (1819-96). A French physicist, born in Paris. His father was a doctor and professor in the medical faculty of the University of Paris. In 1839 he began researches for a method to make permanent the pictures taken by the Daguerre method. He worked for some time with Foucault, and they separated only to have the better chance of progress in solving the question of the speed of light. Fizeau's apparatus was less precise than that invented by Foucault, but Fizeau won the prize of 10,000 francs in 1856, and seven years later became a member of the Academy of Sciences. His works on this subject, on the interference of rays, on the dilatation of crystals, on the polarization of light, and on the speed of electricity, are to be found in the *Annales de physique et de chimie* and in the *Comptes rendus de l'Académie des Sciences.*

FLABEL'LUM (Lat., fan). A sort of fan whose liturgical use is of high antiquity. The Apostolic Constitutions prescribed its use in the eucharist from the consecration to the communion; two deacons were to stand, one on each side of the altar, and gently wave fans of leather, linen, or peacock's feathers, to keep insects away from the chalice. Traces of a similar use in the West are found as late as the fourteenth century. A magnificent specimen, adorned with pictures of saints and dating from the eighth century, is still preserved in the Abbey of Tournus. On certain festivals, when the Pope is carried in the *sedia gestatoria*, two private chamberlains accompany him with *flabella* of peacock or ostrich feathers, and the same custom is observed in the procession of Corpus Christi.

FLAC'CUS. A name taken by Alcuin in the academy at Charlemagne's court.

FLACCUS, Gaius Valerius. A Roman poet who is supposed to have died about A.D. 88. Absolutely nothing is known regarding his life. He is the author of an epic poem on the Argonautic expedition, which in its extant form is incomplete. The general opinion of scholars is that the work is rather a specimen of learned mediocrity than of genuine inspiration. The *editio princeps* of the *Argonautica* appeared in 1472. The best modern edition is that of Bährens (Leipzig, 1875). An English metrical translation was published by one Nicholas Whyte as early as 1565.

FLACCUS, Marcus Verrius. A Roman teacher and savant of the reigns of Augustus and Tiberius. He was the most learned man of his day, and the tutor of the grandson of Augustus. He wrote an antiquarian work, *De Verborum Significatu*, giving, in alphabetical order, an explanation of little known or obsolete words and a description of old rites and customs. This valuable work was afterwards abridged by Festus (q.v.), and has itself disappeared. Flaccus also compiled a calendar of Roman festivals, known as *Fasti Prænestini*, which was set up in the forum of Præneste, where fragments of it have been found. See Fasti.

FLACHAT, flȧ'shȧ', Eugène (1802-73). A French engineer. He was born at Nîmes, and received his education chiefly from his elder brother, Etienne, in association with whom he was engaged from 1823 to 1830 in elaborating the plan of a canal between Havre and Paris. After studying dock construction in England, he returned to France, where he devoted himself to railroad engineering. He was chief engineer of the Eastern Railroad until 1857, when he was appointed to the same position in the Southern Railroad. In 1841 he founded the Society of Civil Engineers, of which he was seven times president. His principal literary productions include: *Etablissements commerciaux, docks de Londres, entrepôts de Paris* (1836); *Rapport sur le canal du Rhône au Rhin* (1840); *Les chemins de fer la 1862 et 1863* (1863); *Traité de la fabrication du fer*, with Barrault and Petiet (3 vols. and atlas, 1842-46; German trans., 1847-51); *Mémoire sur les travaux de l'isthme de Suez* (1865).

FLACIUS, flā'shĭ-ŭs (properly **VLACICH**), Matthias (1520-75). A German Lutheran theologian and controversialist. He was born at Albona, Illyria (for which reason he was often called *Illyricus*), studied at Venice, Basel, Tübingen, and Wittenberg, and in 1544 was appointed to the chair of Hebrew at Wittenberg. Here he strongly opposed the Leipzig Interim (see Interim), and for his attacks upon Melanchthon was obliged to resign his post in 1549. In 1558 he received a professorship at the University of Jena, opened that year. He shortly was involved in a discussion with Viktorin Strigel, a member of the Jena faculty, respecting the value of the will as a factor in conversion. During the colloquy between himself and Strigel, held at Weimar in 1560, he affirmed that original sin was a portion of the substance of the present character of humanity, and thus became discredited as a Manichæan. He was removed from his professorship in 1561, and thereafter was subjected to much persecution. He is still known for his works in biblical interpretation and Church history, including the valuable material prepared by him for the Magdeburg Centuries (q.v.), and the noteworthy *Clavis Scripturæ Sacræ* (1567). For his biography, consult Twesten (Berlin, 1844); Preger (Erlangen, 1859-61).

FLACOURT, flȧ'ko͞or', Etienne de (1607-60). A French colonial officer and author, born at Orléans. He commanded the Royal troops at Fort Dauphin, Madagascar (1648-55), and added the Ile de Bourbon to the possessions of the Crown. Isolated from France during the whole of his régime, he was forced to act upon his own responsibility, and to exercise great severity in restoring order and putting down a rebellion among the native population. After his retirement to his native land he published three works of importance: *Petit catéchisme madécasse et français* (1657); a dictionary of the language; and a history of Madagascar (1658).

FLAD, Henry (1823—). An American civil engineer, born in Bavaria. Soon after his graduation at the University of Munich, in 1846, he came to the United States, where he was appointed engineer on the Ohio and Mississippi Railroad, then in course of construction. He was elected president of the American Society of Civil Engineers in 1886, and became prominently associated with municipal construction in Saint Louis, where he was elected president of the Board of Public Improvements.

FLAG (ODutch *vlagghe*, Dutch *vlag*, Dan. *flag*, Swed. *flagg;* connected with dialectic Swed. *flage*, to flutter in the wind, ODutch *flaggheren*, *vlaggheren*, to flag, droop). A cloth of light material capable of being extended by the wind, and designed to make known some fact or want to spectators. In the army a flag is the ensign carried as its distinguishing mark by each regiment; and also a small banner with which the ground to be occupied is marked out. In the navy the flag is of more importance, often constituting the only means vessels have of communicating with one another, or with the shore.

Naturally, the standard English flag was used by the American Colonies in their early days, and this was commonly the cross of Saint George and later the union cross, the former consisting of a white banner with a red cross. The Puritan spirit was shown when Endecott (q.v.) cut the cross from the flag because it was a Romanist emblem and a relic of Antichrist. The Colonial flags varied in color, it being sufficient if ground and cross differed. Now and then a pine-tree or a hemisphere was figured in the upper left-hand quarter of the cross, and one flag had only the tree for a symbol. When Sir Edmund Andros was Governor, he established a special flag for New England—a white field with a large Saint George cross, and in the centre 'J. R.'—*Jacobus*

Rex (James, King)—surmounted by a crown. The Revolution and the pre-Revolutionary controversies brought in all manner of devices for flags and banners, the larger portion bearing mottoes more or less defiant of the British Government. Soon after the fight at Lexington the volunteers from Connecticut put on their flags the arms of the Colony, with the legend *Qui transtulit sustinet* (He who brought us over sustains us). The Colonial flag of New Amsterdam (substantially the present arms of New York City) was carried by armed vessels sailing out of New York—a beaver being the principal figure, indicative of both the industry of the Dutch people and the wealth of the fur trade. A month after Bunker Hill, Putnam displayed a flag with a red ground, having on one side the Connecticut motto, and on the other side the words then recognized as the motto of Massachusetts—"An Appeal to Heaven." The earliest vessels sailed under Washington's authority displayed the pine-tree flag, though a combination of that and other flags was sometimes used. Many privateers, however, adopted a device consisting of a mailed hand grasping a bundle of thirteen arrows. An early flag in the Southern States was designed by Colonel Moultrie, and was displayed at Charleston, in September, 1775. It was blue, with a white crescent in the upper corner next the staff; afterwards the words 'Liberty or Death' were added. At Cambridge, Mass., on January 2, 1776, Washington displayed a flag, designed by Franklin, Lynch, and Harrison, consisting of thirteen stripes of red and white, with the union jack in place of the stars, the stripes being emblematic of the union of the thirteen Colonies against British oppression. The rattlesnake flag was often used, the snake being coiled to strike, and the motto, "Don't tread on me." The snake's rattles generally numbered thirteen.

No official action was taken with regard to a national flag until June 14, 1777, when the Continental Congress passed a resolution, "That the flag of the thirteen United States be thirteen stripes, alternate red and white; that the union be thirteen stars, white in a blue field, representing a new constellation." The origin of this design has been the subject of much controversy, which has left the subject unsettled, though perhaps a majority of writers consider the design to have been suggested by the coat-of-arms of the Washington family, which contains both the stars and the stripes. Paul Jones claimed to have been the first to raise the new flag over a naval vessel, and it seems that the first use of the Stars and Stripes on land was at Fort Stanwix, where a hastily improvised flag was raised over some captured British colors on August 6, 1777. (See FORT STANWIX.) The flag was used at the battle of Brandywine, and thereafter in all important engagements until the close of the war. On January 13, 1794, Vermont having been admitted to the Union in 1791 and Kentucky in 1792, Congress enacted, "That from and after the first day of May, one thousand seven hundred and ninety-five, the flag of the United States be fifteen stripes alternate red and white; that the union be fifteen stars, white in a blue field," the intention apparently being to add both a stripe and a star for each new State admitted. In 1818, however, the number of States having increased to twenty, Congress enacted that the number of stripes be reduced to thirteen, to typify the original thirteen States; that the number of stars be increased to twenty; and that "on the admission of every new State into the Union, one star be added to the union of the flag, and that such addition shall take effect on the Fourth of July next succeeding such admission." No provision was made for the manner of arrangement of the stars, and consequently there has been since 1818 much divergence in this respect. The union jack consists of a blue ground, without stripes, having the stars in white. It is used by pilots, and in the bow of boats for ambassadors and ministers. During the Civil War the seceding States had a number of distinct flags. Early in 1861, however, their Congress decided upon what was popularly called the 'Stars and Bars,' which was composed of three broad horizontal bars, the two outer ones red and the middle one white, with a blue 'union' containing seven white stars in a circle. The number of stars was subsequently increased to thirteen. The Confederate battle-flag used throughout the war consisted of a field of red on which was a blue Saint Andrew's cross bordered with white and bearing thirteen white stars. In 1863 the Confederate Congress adopted a flag having a white field with a union or canton of the battle-flag. This was sometimes mistaken for a flag of truce, so in 1865 a red bar was imposed across the end of the field.

There are many flags which designate special or official position or authority, such as royal standards, the President's flag, and the Secretary of the Navy's flag. The President's flag, which is carried at the main of naval vessels and on boats in which he embarks, is blue, with the coat-of-arms of the United States. The Secretary of the Navy's flag is blue, and has a white foul anchor in the centre surrounded by four white stars. The flag of the revenue marine has sixteen perpendicular red and white stripes alternating. The 'union' carries the coat-of-arms of the United States, and occupies the width of eight stripes. The flags of the flag-officers of the United States Navy are blue, carrying white stars—four stars for the admiral, and two for rear-admirals. In case two or more rear-admirals are in company, however, the one second in rank flies a red flag with two white stars and the junior rear-admirals fly white flags with two blue stars. The commodore's flag shown in the illustration is no longer in use, since the grade of commodore on the active list was abolished in 1899. The revenue flag, used to indicate the jurisdiction of the Treasury Department, was adopted in 1799. It is shown in the accompanying illustration. The flag of the Secretary of War is of scarlet bunting, having upon it an eagle with outstretched wings. Garrison, post, and storm flags are national flags made of bunting. The flag of the Geneva Convention in connection with the national flag is used for army hospitals. In foreign countries the royal standard is displayed at ceremonies in honor of the sovereign, or at which the sovereign may be present, and it, or the national ensign of the country, is hoisted at the main of vessels aboard which such sovereign goes. When ministers, consuls, etc., leave men-of-war that they have officially visited, the flag of the nation to which they belong is hoisted at the fore upon their departure, during the firing of a salute in their honor. A flag placed at 'half-mast' is a sign of mourning. A flag reversed, or with the union down, indicates distress. When saluting is done with the flag, the salutes are made by 'dipping' it, usually three times—that is, hauling it down a few feet and then running it up again. In the navy, when the flag is hoisted at 'colors' or hauled down at sunset, all officers and men are required to salute it.

Flag captain, or *fleet captain*, is an unofficial title applied to the captain of the flagship. He is announced as 'chief of staff' by a general order issued by a commander-in-chief upon taking command. A separate officer for this duty is no longer ordered in the United States Navy. The accompanying illustration shows the various United States flags and the merchant flags of the more prominent foreign nations. Consult Preble, *History of the Flag of the United States* (Boston, 1872).

FLAG (probably ultimately identical with *flag*, banner, from its waving in the wind). A popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations. It is sometimes particularly appropriated to species of the genus Iris, or flower-de-luce; but is given also very indiscriminately to other plants of similar foliage, as the sweet flag (*Acorus calamus*) and the catstail reed (*Typha*). See ACORNS; IRIS.

FLAG′ELLANTS (Fr. *flagellant*, It. *flagellante*, from Lat. *flagellare*, to scourge, from *flagellum*, scourge, diminutive of *flagrum*, whip). The name given to certain bodies of fanatical enthusiasts, who at various intervals from the thirteenth to the sixteenth century made their appearance in different countries of Europe, proclaiming the wrath of God against the corruption of the time, inviting sinners to atone for sin by self-inflicted scourgings or flagellations, and themselves publicly enforcing this exhortation by voluntary scourging of themselves, and by other forms of self-castigation. These fanatical movements recurred at frequent intervals. The most remarkable, however, are two in number. The first originated at Perugia in 1260, at a time when society in Italy was greatly disorganized by the long-continued struggles of the Guelph and Ghibelline factions. The disorders of the time favored the movement, and it soon became so formidable as to draw upon itself the suspicion of Manfred, the son of Frederick II., by whom it was vigorously suppressed. Early in 1261 it had died out in Italy. Later offshoots of the party made their appearance in Bavaria, Austria, Moravia, Bohemia, Poland, and France, when to their extravagant practices they added still greater extravagances of doctrine. In virtue of a pretended revelation, they asserted that the blood shed in self-flagellation had a share with the blood of our Lord in atoning for sin; they mutually confessed and absolved each other, and declared their voluntary penances to be a substitute for all the sacraments of the Church, and for all the ministrations of the clergy. The Jews were an object of special abhorrence, and suffered dreadfully from the fury of the flagellants in many of the towns of Germany and the Netherlands. The second outbreak of flagellantism originated in Germany in 1349. Its immediate occasion was the terror inspired by the plague known as the Black Death, which devastated Europe in a fearful manner during 1347-49 (consult Hecker, *Epidemics of the Middle Ages*, Eng. trans., London, 1846). These fanatics went about the country in organized bands, each member bound by an oath to render implicit obedience to the leader, to abstain from all physical pleasures, and to submit to scourgings and tortures for a period of 33 days in commemoration of the 33 years of the life of Jesus. They wore a cloak with red crosses sewed upon it, and red crosses on the hat. In regular procession they proceeded from town to town, and in the public places threw themselves on the ground and scourged one another, singing pentitential songs, and exhorting the bystanders. The movement, attended with some beneficial results at first, soon came to be marked by excesses and immoralities. From Germany it spread to the Netherlands, Switzerland, Sweden, and even England. The flagellants were rigorously excluded from France, but made their way into Avignon, then the Papal residence, and were condemned by Clement VI. After 1350 bands of flagellants appeared only sporadically. In 1414 a new troop of flagellants, locally called *Flegler*, appeared in Thuringia and Lower Saxony under the lead of one Conrad Schmidt. They renewed and even exaggerated the wildest excesses of their predecessors, rejecting all the received religious usages, and all external worship, placing their entire reliance on faith and flagellation. Schmidt declared that the blood of scourging was the true wedding garment of the Gospel, that it was more precious than the blood of the martyrs, and a sure passport to eternal life. The violence of these fanatics drew upon them the severest punishments of the Inquisition. Nearly 100, among them Schmidt, were burned at Sangershausen in 1414, and others perished in other places. Their doctrines, comprised in 50 articles, were condemned by the Council of Constance (1414-18). Nevertheless they appear occasionally until 1454, after which year they cease to be mentioned. Independent of this movement bands of 'scourgers' appeared in Spain, southern France, and North Italy toward the close of the fourteenth century, under the lead of Vincent Ferrer. They wore a long white garment, veiling head and features, and from this received the name of *albi*, white. In large companies they went through the towns, praying, singing, and scourging one another. After the Council of Constance they gradually disappeared.

Flagellation as an ecclesiastical punishment has been used from the fifth century on clerical, monastic, and lay individuals. As a means of self-discipline and aid in attaining the heights of ascetic piety it found early use in the religious communities. The Roman Catholic Church holds the lawfulness, and even the meritorious character, of voluntary self-chastisement, if undertaken with due dispositions, practiced without ostentation or fanaticism, and animated by a lively faith and a firm hope in the merits of Christ (cf. I. Cor. ix. 27; Col. iii. 5). This is the self-castigation known under the name of 'the discipline.' On the general subject, consult: Förstemann, *Die christlichen Geisslergesellschaften* (Halle, 1828); Cooper, *Flagellation and the Flagellants* (London, 1896); Lea, *History of the Inquisition* (New York, 1875), and *History of Auricular Confession and Indulgences* (New York, 1896); Heimbucher, *Die Orden und Kongregationen der Katholischen Kirche* (Paderborn, 1897).

FLAGELLATA, flăj′ĕl-lā′tȧ (Neo-Lat. nom. pl., from Lat. *flagellum*, whip). In zoölogy, a name often applied to the class Mastigophora (q.v.) of the order Protozoa (q.v.), but now restricted to an order of that group. In botany, a large group of organisms presenting characters somewhat intermediate between plants and animals, but now thought to be most closely related to the algal group of the Volvocales. (See Algæ.) The Flagellata may be colorless, but they frequently contain green, yellow, brown, or red color bodies, which perform the functions of food manufacture (photosynthesis). The cells generally have one or two cilia, and are provided with a contractile vacuole and red pigment spot. There is no method of sexual reproduction, but resting cells (cysts) are formed. The genera Peridinium and Euglena include some of the species of this group.

FLAGEL′LUM DE′I (Lat., The Scourge of God). A title given to Attila, King of the Huns.

FLAGEOLET, flăj′ō-lĕt (OF., Fr. *flageolet*, diminutive of OF. *flageol*, Prov. *flaujol*, flute, from ML. **flautiolus*, little flute, from *flauta*, flute, from Lat. *flatus*, blast, from *flare*, to blow). A wind instrument of the flute family. It is made of boxwood or ivory, in several pieces, and has holes for the fingers, like the flute. Its compass is from g^1 to $b^3\flat$, and the tones sound a fifth higher than written. The flageolet differs from the flute in so much that it has a mouthpiece, and is also played in a vertical, instead of horizontal position. The character of the tone is somewhat similar to that of the ordinary flute, but more mellow. The instrument is not used in the orchestra to-day. Mozart employed it, but since his time no other composer has made use of it. See Flute.

FLAGEOLET-TONES. An obsolete name for harmonics (q.v.).

FLAGET, flȧ′zhȧ′, Benedict Joseph (1763-1850). A bishop of the Roman Catholic Church in America. He was born in Contournat, Auvergne, France, and was educated at the College of Billom, and at the College of the Sulpitians at Clermont, becoming a member of that Order in 1783. He was ordained a priest in 1788, and held a professorship of dogmatic theology at the university at Nantes and at the Sulpitian Seminary at Angers. In 1792 he was compelled to flee from France, and settled in America, first at Baltimore, and later as chaplain at the military post of Vincennes, in the newly organized Northwest Territory. In 1795 he returned East and accepted a professorship in Georgetown College, where he remained three years. In 1798 he went to Havana, returning in 1801 with twenty-one Cuban students to be educated at Georgetown, where he resumed his professorship. In 1808 he was appointed Bishop of Bardstown (Kentucky), with an extensive diocese that reached from the Alleghanies to the Mississippi, and from the Great Lakes southward to the thirty-fifth parallel. He spent the years 1808-10 in Europe, and was consecrated on his return in the latter year. He entered upon his duties in the face of great difficulties with remarkable energy, and his exertions were crowned with unusual success. He resigned his see in 1829, but withdrew his resignation on the universal demand for him to continue. By 1834 he had erected four colleges, a female orphan asylum, eleven academies for girls, and had introduced into his diocese three religious sisterhoods and four religious orders for men. He spent the years 1835-39 in Europe. In 1841 the seat of his diocese was removed to Louisville, where his activities continued until his death.

FLAGFISH. A coral-fish (*Heniochus macrolepidotus*) of Japanese and Philippine waters, so called from the fancied resemblance of its slender erectible dorsal fin to a flagstaff. See Colored Plate of Philippine Fishes.

FLAGG, George Whiting (1816-97). An American genre-painter, born in New Haven, Conn. He studied for some time in Washington, D. C., under Allston, and then went to Europe and stayed in Italy three years. He became a member of the National Academy of Design in 1851. His best-known pictures are "The Murder of the Princes," "The Landing of the Pilgrims," "The Scarlet Letter," "Columbus and the Egg," and "The Match Girl." The coloring in these works is rich and harmonious.

FLAGG, Jared Bradley (1820-99). An American artist and clergyman, born in New Haven, Conn. He studied art under his brother, George Whiting Flagg, became a clergyman in the Episcopal Church in 1854, and was for eight years rector of Grace Church, Brooklyn Heights, N. Y. Though Dr. Flagg painted ideal figure pictures, notably "Hester Prynne in Prison," portrait painting was his specialty. His excellent portrait of William M. Evarts (1887) hangs in the State Capitol at Albany. He published *Life and Letters of Washington Allston.*

FLAGG, Wilson (1805-84). An American naturalist, born at Beverly, Mass. After three months of residence at Harvard he studied medicine, which he never practised, and later became a contributor to the *Weekly Magazine*, the *Post*, and the *Atlantic Monthly*, all of Boston. He at first wrote on politics, but soon turned his attention to natural history, and particularly to ornithology. In 1844-48 he was connected with the custom-house of Boston. His publications include *Studies in the Field and Forest* (1857), and *Birds and Seasons of New England* (1875).

FLAG′LER, Isaac Van Vleck (1848—). An American organist, born in Albany, N. Y. He had already become well known locally when he went to Paris to study under Batiste. Afterwards he was organist at Plymouth Church, Chicago, musical lecturer at Chautauqua, and organist of the First Presbyterian Church in Auburn, N. Y. For a number of years he taught music at Syracuse and Cornell Universities, and at the Utica Conservatory of Music. He was co-founder of the American Guild of Organists. His *Variations on an American Air* is the most popular of his organ compositions.

FLAG-OFFICER. In the United States Navy, an officer entitled by his rank to carry at the masthead a flag instead of a pennant, indicative of his command. At present the flag-officers are admirals, who carry the flag at the main, vice-admirals, who carry it at the fore, and rear-admirals, who carry it at the mizzen. In case a ship has but two masts they are called the fore and main; the flag of a rear-admiral is then hoisted at the main. (For admiral's flag, see Flags, United States, Colored Plate.) Previous to the abolition of the grade of commodore (q.v.) officers of this rank were included among the flag-officers. See Admiral.

FLAG OF THE PROPHET (Ar. *sinjaq sharif*, noble standard). The sacred banner of the Mohammedans. It was originally of a white color, and was composed of the turbans of the Koreish, captured by Mohammed. A black flag was, however, soon substituted in its place, consisting of the curtain that hung before the door of Ayesha, the favorite wife of the Prophet. This flag, regarded by the Mohammedans as their most sacred relic, was first held by the successors of Omar at Damascus; it afterwards fell into the hands of the Abbassides, caliphs of Bagdad, and, at a later period, was brought into Europe by Amurath III. It was covered with forty-two wrappings of silk, deposited in a costly casket, and preserved in a chapel in the interior of the seraglio, where it is guarded by several emirs, with constant prayers. The banner unfolded at the commencement of a war, and likewise carefully preserved, is not the same, although it is believed by the people to be so.

FLAG OF TRUCE. A white flag exhibited by one of two contending forces, indicating a desire to communicate. The necessity of occasionally communicating with the enemy in time of war, and the fact that this can usually be best done by means of a flag of truce, has given to the latter a sort of sacred character, which is recognized by all civilized people and by many savages as well, and a violation of the recognized immunities of the flag and of its bearers is regarded as just ground for retaliation and punishment. The immunities of the bearer are not, however, absolute. If it appear during an engagement firing need not terminate, and if the bearer or a person accompanying him be killed or injured there is no ground for complaint. Deliberate firing upon a party bearing a flag of truce, unless they have been warned not to proceed, is regarded as a breach of the military or naval code. A flag of truce, to have the ordinary immunity, must be sent by the senior officer present, and it can only be received at the will of the senior officer of the other side. In a naval battle the vessel bearing it should not attempt to proceed beyond a point at which her character can be easily ascertained; should she attempt to go farther she may be warned by a shot across her bow, and if she does not then stop she will be fired into. Having been warned to stop, she must then await the pleasure of the enemy; if he declines to communicate she must perforce retire, but this is unusual. The detention of a flag of truce beyond the lines is a protection to the receiving side against espionage, torpedo attack, etc. Any attempt to obtain information of the enemy's position, condition, or force through a flag of truce may subject the bearer to trial as a spy. In any case he may be detained as a prisoner if the receiver deems it desirable. In dispatching a flag of truce, except during an engagement, the flagship of the senior officer should keep her colors flying and a white flag at the fore; and if the senior officer of the enemy receives the flag-bearer his ship should do likewise during the progress of the conference, and afterwards until the flag-of-truce boat has reached its inner lines. The boat carrying the flag should be met at the proper point by one in charge of an officer of suitable rank from the other senior officer, which should fly a white flag while going and returning.

FLAGON, Moll. A female camp-follower, in Burgoyne's comic opera *The Lord of the Manor.* The rôle may have been suggested by Kate Matchlock, in Steele's *The Funeral,* and, owing to the broadness of its humor, it was played by male actors.

FLAGSTAFF. A town in Coconino County, Ariz., on the Santa Fé Pacific Railroad (Map: Arizona, C 2). It is at an altitude of 6935 feet, and is south of the San Francisco Mountains, one of which, San Francisco Peak (12,800 feet), is of particular interest, being an extinct volcano. The Northern Arizona Normal School is here, and to the northwest of the town is the Lowell Observatory. Flagstaff has extensive live-stock and lumber interests. A railroad extends from the vicinity of the town to the Grand Cañon of the Colorado. Population, in 1890, 963; in 1900, 1271.

FLAGSTONE (*flag,* Icel. *flaga,* slab, from *flagna,* to flake off + *stone,* AS. *stān,* Icel. *steinn,* Goth. *stains,* OHG. *stein,* Ger. *Stein,* stone). A rock which splits into tabular masses, or flags, of various sizes and thickness, along the original planes of stratification. Flagstones are generally sandstones, containing more or less argillaceous or calcareous matter; some, however, are indurated clays, and others thin-bedded limestones. They are used for pavements, cistern-linings, etc. Bluestone is a variety of sandstone of Devonian age found in New York, Pennsylvania, and New Jersey, and excellently adapted for paving purposes. It forms the basis of a large industry. Other formations yielding flagstones are the Carboniferous of Ohio and Pennsylvania, and the Triassic brownstone of Connecticut.

FLAHAULT DE LA BILLARDERIE, flȧ′ō′ d*e* lȧ bê′yär′drẽ′, Auguste Charles Joseph, Comte de (1785-1870). A French soldier and diplomat, born in Paris. His family was forced to leave France at the time of the Revolution, and did not return until 1798. He accompanied Napoleon into Italy, and was made lieutenant at Marengo. In 1837 he became general of division, and afterwards Napoleon appointed him to treat for peace with the Allies; but this task was too much for Flahault's diplomacy. After the Emperor's return from Elba he fought under him at Waterloo, and upon the French defeat upheld the cause of Napoleon's son, the King of Rome. He then went to England as an exile, and married there Lady Keith, a peeress in her own right, and did not return to France until 1827. The Revolution of 1830 restored him to his titles. He was made Minister Plenipotentiary to Berlin in 1831, and from 1841 to 1848 was Ambassador to England. The Second Empire brought him the additional honor of Senator (1853), and the grand chancellorship of the Legion of Honor (1864).

FLAIL. See Threshing.

FLAM′BARD, Ranulf (?-1128). Bishop of Durham in the time of William II. and Henry I. He was a Norman of humble origin who took holy orders, and became chaplain to William Rufus, who, in 1099, made him Bishop of Durham, and one of his principal advisers. To obtain money for the King, he resorted to oppressive measures which earned him the hatred of the people. His extortions were so flagrant that a plot was formed against his life, but the conspirators quarreled and the Bishop was spared. As soon as William died Henry I. sent Flambard to the Tower. He escaped and fled to Normandy, where he instigated Duke Robert to an invasion of England and accompanied the Duke on the expedition. Later he was pardoned and restored to the bishopric of Durham. Thenceforward Flambard appears to have led a more edifying life, devoting himself to important architectural works. Consult: Stubbs, *Constitutional History of England*, vol. i. (Oxford, 1874); Freeman, *The Norman Conquest*, vols. iv., v. (Oxford, 1870-79); id., *William Rufus* (Oxford, 1882).

FLAMBOROUGH, flăm′bûr-ō. The name of a farmer's family in Goldsmith's *Vicar of Wakefield* (q.v.).

FLAMBOROUGH HEAD. A promontory of the Yorkshire coast, England, extending into the North Sea. It forms the northern boundary of Bridlington Bay, terminating in a range of perpendicular chalk cliffs, six miles long, 300 to 450 feet high (Map: England, G 2). It contains many caverns and outlying picturesque rocks, which swarm with sea-fowl. On the head is a lighthouse, 214 feet high, its light visible 21 miles. Across the peninsula, ending in the head, runs an early British intrenchment, with two lines of breastworks, called Dane's Dike.

FLAMBOY′ANT (Fr. *flamboyant*, pres. part. of *flamber*, to flame, OFr. *flamber, flamer*, from Lat. *flammare*, to flame, from *flamma*, flame; connected with *flagrare*, to blaze, Gk. *φλέγειν*, *phlegein*, to burn, Skt. *bhrāj*, to be bright, AS. *blāc*, shining, pale, Icel. *bleikr*, pale, Eng. *bleak*). The name given to the latest style of Gothic architecture in France. It prevailed there during the late fifteenth and early sixteenth centuries, and corresponds to the Perpendicular (q.v.) in England. The name is derived from the flame-like forms of the tracery of the windows, panels, etc., which replaced the more regular earlier traces, inscribed in circles and triangles. The characteristics of this style are minute and elaborate ornament, combined with general bareness of surface; a multiplication of the arch-forms used, the reverse point and flat-arched forms being common; a reversion to horizontal effects, as in galleries, breaking up the vertical lines of pure Gothic. The crockets, for instance, are generally cut into a great number of small leaves, while they are placed far apart; the moldings are divided into large hollows, often empty, but sometimes filled with minutely naturalistic vine foliage and small, thin fillets and beads; the finials have crockets minutely carved, set upon bare pyramidal terminals; the arch-moldings are divided into a great number of small parts, and lack the boldness and decision of the earlier styles. These moldings are frequently abutted on the pillars, or continued down them without any caps; and when there are no caps, they are small and without effect. When moldings join they are frequently run through one another, so as to appear to interlace. The effect is intricate rather than beautiful, suggestive, like the rest of the style, of ingenuity in stone-cutting rather than art. The doorways and windows are sometimes large and fine; but while these are highly enriched, the general surface of the building is left too plain, and the effects are thin. There are many large buildings in France executed in this style, but it is usually portions only which are fine, not the general effect. The most remarkable are Saint Maclou at Rouen, Saint Jacques at Dieppe, Saint Riquier near and Saint Wolfram at Abbéville, the cathedral façades of Tours and Troyes, and the Church of Brou. Some of the spires of this period are also very beautiful. The northern spire of Chartres Cathedral, for example, is considered one of the finest in France. In England also, Flamboyant tracery was introduced at the close of the Decorated period, but was so quickly superseded by the Perpendicular style that it did not form a separate style; it is there called 'flowing,' or 'curvilinear,' and can be seen at Lincoln (south transept), Ely (south aisle and triforium), and Wells. The corresponding stage of Gothic development in Spain, Germany, and the Netherlands is rather merely florid than based upon any clear principle of design, such as the Flamboyant.

FLAME (OF. *flambe*, Fr. *flamme*, Port. *flamma*, from Lat. *flamma*, flame). An incandescent gaseous mixture usually produced by the chemical combination of various combustible substances with the oxygen of the air. A flame generally consists of several parts differing from one another in temperature, color, illuminating power, etc. The flame of a lamp or candle, or simple gas-jet, consists of a hollow cone, in the centre of which there is no combustion. The central space appears dark only by contrast with the luminous cone which surrounds it. It consists, in reality, of colorless substances which are constantly rising into the flame. If a glass tube, open at both ends, be held obliquely in the flame of a candle, with its lower extremity in the dark central space above the wick, it will conduct away a portion of the combustible vapor, which may be kindled like a gas-jet at its upper end. The inner cone is enveloped by a bright luminous area in which the processes of chemical combination are more energetic, and which furnish most of the light yielded by the candle. The luminous cone is in its turn surrounded by an envelope emitting but little light and having a yellowish color; this part of the flame consists of a mixture of the products of combustion with air, all heated to incandescence.

TEMPERATURE. The temperature of a flame (usually about 2000° C., or 3632° F.) depends mainly on the heats of combustion of the burning gases and the specific heats of the products of combustion. The amounts and the specific heats of other gases that may be present likewise exert their influence on the temperature of the flame, part of the heat of combustion being consumed in raising the temperature of such gases; thus the temperature of a gas burning in pure oxygen is considerably higher than that of the same gas burning in air, owing to the presence of cold nitrogen in the latter. Part of the heat of combustion is also lost in the decomposition of carbonic acid in the flame. At elevated temperatures carbonic-acid gas partly dissociates into carbonic oxide and oxygen, according to the following equation:

$$\underset{\text{Carbonic acid}}{2CO_2} = \underset{\substack{\text{Carbonic}\\ \text{oxide}}}{2CO} + \underset{\text{Oxygen}}{O_2}$$

The degree of dissociation is the greater, the higher the temperature and the lower the pressure of carbonic acid during the process. Since the ordinary illuminants contain a high percentage of hydrogen, the amount of carbonic acid produced during their combustion is relatively small; or, in other words, the partial pressure of carbonic acid in the flame is low and its degree of dissociation is correspondingly high, as much as one-tenth of the carbonic acid being often broken up according to the above reaction. The amount of sensible heat thus consumed is therefore very considerable.

Luminosity. The luminosity of flames, such as those obtained by burning coal-gas or a candle, is due mainly to the incandescence of the carbon particles produced by the chemical decomposition of the combustible gases. If enough air is mixed with the latter previous to their entering the flame, complete combustion takes place as soon as the hot part of the flame is reached; there is, consequently, no separation of solid carbon, and the flame is practically non-luminous throughout. This is the principle of the well-known Bunsen burner. That solid carbon exists in an ordinary luminous flame may be readily shown by holding in it a glass rod or a piece of white porcelain, a coating of carbon being then deposited in the form of soot. A certain amount of light, however, is also produced by the incandescence of the gases themselves; this amount of light emitted is proportional to the capacity of the gases for absorbing the same kind of light at the temperature of the flame. The luminosity of a flame depends greatly on its temperature, and increases even more rapidly than the latter; the luminosity of ordinary flames is considerably diminished by the dissociation of carbonic acid, since the dissociation causes a fall of temperature. Another one of the factors determining the luminosity of a flame is the density of the medium in which combustion takes place, an increase of density usually causing a corresponding increase of luminosity. Thus in air kept under a constant pressure of about 10 atmospheres, hydrogen burns with a bright flame; on the contrary, under sufficiently diminished pressures a candle may burn with a pale, non-luminous flame. The size of a flame depends on the pressure, the temperature, and the diffusibility of the reacting substances, on the form of burner used, etc.

Color. The color of a flame is determined mainly by the nature of the substances that may be introduced into it. Thus sodium imparts to a flame a bright yellow color, potassium a characteristic violet color, copper usually a green color, strontium a crimson color, etc. Many chemical substances may be identified by introducing them into the colorless flame of a Bunsen burner, the color imparted to the flame often revealing the nature of the substance. See Analysis, Chemical.

FLAMEL, flȧ'mĕl', Nicolas (c.1330-1418). A French calligrapher, legal writer to the University of Paris. He was born of humble parents, probably at Pontoise, at a time when beautiful penmanship, the illuminating of manuscripts, and similar work, ranked high in art. He began business in two stalls near the Church of Saint-Jacques-la-Boucherie, Paris, and succeeded so well that in the same locality he afterwards built a house with a highly decorative exterior, which was called 'l'hostel Flamel.' He took day pupils and boarders, sons of the aristocracy, and it was rumored that he combined money-lending with art and literature. However, he gained great wealth, wherewith he built churches, endowed religious houses, and was munificent in his charities, inspired partly by ostentatious vanity. He and his wife are personally represented in the ornamentation of some of his donations. The common people looked upon him with awe, as one who had found the secret of eternal life and the art of turning all he touched to gold, but at his death he was found to have been less wealthy than was generally supposed. He wrote a summary of his philosophy and two treatises on alchemy.

FLAMENG, flȧ'mäɴ', François (1856—). A French figure painter, born in Paris. He was the son and pupil of Léopold Flameng, and afterwards studied painting under Cabanel, Laurens, and Hédouin. In 1879 he exhibited "The Girondins Summoned," which created much comment. This ambitious work was followed by "The Conquerors of the Bastile" (1881); "Marie Antoinette on Her Way to the Scaffold" (1885); "The Duel" (1883); and "Waterloo" (1898), all marked by excellent color and spirited execution. His important decorations for the stairway of the Sorbonne consist of seven subjects from the history of that institution. He also painted portraits.

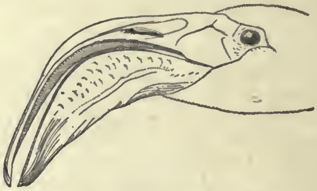
FLAMENG, Léopold (1831—). A French engraver, born in Brussels. He was the pupil of Calamatta in Brussels, and then went to Paris (1853), where he worked at first in watercolor. At this time he began his connection with the well-known journal, the *Gazette des Beaux-Arts*. The most remarkable feature of Flameng's plates is the facility with which he interprets artists working in every style and all kinds of pictures, ancient or modern. Among his plates are: "The Death of the Virgin," after Martin Schoen; "The Charge of the Artillery," after Schreyer; "Phryne," after Gérôme; "Miss Graham," and the "Blue Boy," after Gainsborough; "The Source," after Ingres; "The Hundred Florin Piece," after Rembrandt; and "The Death of Sainte Geneviève," after Laurens. His other works include forty water-colors for Blanc's *Œuvre complet de Rembrandt* (1859), and thirty-two water-colors for the *Théâtre complet de Molière* (1876-83).

FLAMENG, Marie Auguste (1843—). A French painter, born at Jouy-aux-Arches, near Metz. He studied under various masters, ending with Delaunay and Puvis de Chavannes, and began to exhibit in 1870. After 1874 he devoted himself to marines. His "Fishing Boat at Dieppe" (1881), in the Luxembourg, is a good example of his vigorous, fresh treatment of sea subjects.

FLA'MENS (of doubtful origin; by some connected with Skt. *brahman*, priest, from *barh*, to be great; by others compared with Goth. *blōtan*, AS. *blōtan*, to reverence, or with Lat. *flagrare*, to blaze, Gk. *φλέγειν*, *phlegein*, to burn, Skt. *bhrāj*, to be bright; hardly related to Lat. *flare*, to blow, OHG. *blājan*, Ger. *blähen*, AS. *blāwan*, Eng. *blow*). In the Roman religion, sacrificial priests, each of some special divinity. They were sometimes chosen for life, sometimes annually; sometimes were attached to *collegia*; sometimes, especially outside of Rome, were independent. The most important were those attached to the College of Pontifices, originally 15 in number, of whom 12 (*flamines minores*) were plebeians and seem early to have been neglected, as the names of only 9 are known. The remaining 3 (*flamines maiores*, or simply *flamines*) were always patricians, and were the *flamines Dialis, Martialis, Quirinalis.* All of these were bound by a strict ceremonial, which for a long time prohibited them from holding any other office; and though this rule was relaxed from about B.C. 200, permission to hold military command or to be absent from Italy was never granted to the *flamines Dialis,* and only very late to the others. The *flamen Dialis* (of Jupiter) was bound by very strict regulations. He could not take an oath, mount a horse, see an army, or even any one at work; he must keep carefully aloof from all impurity, and always wear his official dress, fastened with brooches, for no knot was allowed, and on his head the *pilleus,* a pointed cap, on the top of which an olive twig was fastened by a fillet of wool. He was also forbidden to pass a night away from his house. His wife, the *flaminica,* a priestess of Juno, was bound by similar restrictions, and in case of her death the flamen was obliged to resign. These restrictions were accompanied by privileges—the curule chair, the *toga prætexta,* the attendance of a lictor, and a seat in the Senate—while a prisoner who entered his house was at once freed from his chains, and he who touched his knee could not be executed on that day. The office was found so burdensome that during the last century of the Republic it remained unoccupied for seventy-five years. The *flamines* were installed in the Comitia Calata, and were chosen by the *pontifex maximus* from three candidates nominated by the *pontifices.* Other flamens were the *flamines curiales, flamines divorum* for the worship of the emperors, and the *flamen arvalium,* belonging to the Arval Brothers (q.v.). Consult: Marquardt, "Römische Staatsverwaltung," in *Handbuch der römischen Altertümer* (Leipzig, 1885); Daremberg and Saglio, *Dictionnaire des antiquités grecques et romaines* (Paris, 1896).

FLAMIN'EO. The brother of Vittoria Corombona in Webster's *White Devil.* He encourages his sister in her course of action, and finally stabs her. Some of the finest passages are assigned to the character in spite of its moral ugliness.

FLAMINGO (Port., older form *flamengo,* Sp. *flamenco,* from Port. *flammant, flambant,* OF. *flaman, flambant,* Fr. *flamant,* flamingo, flaming, pres. part. of Port. *flamar,* OF. *flamer,* to flame, from Lat. *flamma,* flame; influenced in popular etymology by Port. *Flamengo,* Sp. *Flamenco,* Fr. *Flamand,* Fleming). One of a group of waterbirds of remarkable appearance, having a gooselike body mounted upon long legs and surmounted by an extremely long and flexible neck, terminated by a huge misshapen beak. (See Colored plate of WADING BIRDS.) Eight species are recognized, forming the family Phœnicopteridæ, all rose-red in color, and distributed throughout the warmer parts of the world. They gather in flocks upon marshes and river-banks, and in migration fly like geese, in long strings, or a wedge formation, their legs trailing behind and their necks folded upon their backs. The great length of the neck is due not to an extraordinary number (eighteen) of bones, but to the unusual length of each vertebra. Measured from beak to toes, their matured length may exceed six feet, but as the legs, which are naked far up to the thigh, are only about two feet long, and the body is small, the apparent size is much less.



BEAK OF AMERICAN FLAMINGO.

The food of these quaint birds is derived from the water and mud, and in seeking it they wade about in shallow places, supported upon the soft mud by their great webbed feet, which are kept in motion to disturb the bottom and stir out its lurking contents. The bill is large, deeper than broad, and suddenly curved downward near the middle, so that, as the bird wades and seeks its food, either in the water or in the mud, it makes use of the bill in a reversed position, the upper mandible being lowest. The edges of both mandibles are furnished with small and very fine transverse laminæ, which serve, like those in the bills of the ordinary marsh-duck, to prevent the escape of the small crustaceans, mollusks, worms, small fishes, seeds, etc., which are the flamingo's food, and to separate them from the mud with which they may be mingled. The upper surface of the tongue is also furnished on both sides and at the base with numerous small flexible horny spines, directed backward. They make their nests gregariously in marshes, scraping up a heap of mud, on the top of which is the nest, containing two chalk-white eggs. Many fables remain in the old books as to these nests, but the truth is that the heaps of mud are only of such a height as will lift the eggs well above the surrounding water, and that the female sits with her legs folded comfortably beside her. Their favorite breeding-places are salt lakes and marshes, such as the broad *marasmas* of Spain and the great Atacama saline marshes in South America.

The flamingo of the Mediterranean region (*Phœnicopterus antiquorum*) ranges far eastward and southward, and the three other species, so called, of southern Africa and southeastern Asia, may prove to be mere varieties of it. A species is peculiar to Chile, and another (distinguished by the absence of a back toe) to the elevated desert of Atacama, on the border of Chile and Bolivia. The North American flamingo (*Phœnicopterus ruber*), once common in all the Southern United States, but now grown very rare north of the Bahamas, West Indies and Central America, is remarkable for the deep vermilion color of its plumage, set off by black wing-quills, which has made it too attractive to sportsmen and plume-hunters. The males show the brightest plumage, the young being nearly white and the females pale pink.

The classification of these birds has been a puzzle to ornithologists, but they are now regarded as a family representing a distinct order (Odontoglossæ), usually ranked as intermediate between the anserine birds and the spoonbills, ibises, etc. Consult: Newton, *Dictionary of Birds* (London and New York, 1893-96); Cory, *Birds of the Bahamas* (Boston, 1880); A. Chapman, *Wild Spain* (London, 1893); F. M. Chapman, *Bird Lore*, vol. v. (New York, 1902).

FLAMIN'IAN WAY (Lat. *Via Flaminia*). The great northern road of ancient Italy, leading from Rome to Ariminum (*Rimini*) on the Adriatic. It was constructed by G. Flaminius during his censorship (B.C. 220), and was designed to secure a free communication with the recently conquered Gallic territory. The Flaminian Way was one of the most celebrated and most frequented roads of Italy during the period of the Republic and also of the Empire. Leaving Rome by the Porta Flaminia (near the Porta del Popolo), it crossed the Tiber at the famous Milvian bridge, and ran nearly due north, crossing the river again near *Borghetto*, till it reached Narnia (*Narni*). At this point the original road continued to the northeast by way of Mevania (*Bevagna*) to Forum Flaminii. A branch was later built to the east, passing through Interamna (*Terni*) and Spoletium (*Spoleto*), and meeting the main road at Fulginium (*Foligno*), south of Forum Flaminii. From this point the road ran north and northeast through the Apennines till it reached the Adriatic at Fanum Fortunæ (*Fano*), where it followed the coast-line to Ariminum (*Rimini*), where it ended, or rather where the name ceased; for the Via Æmilia (see EMILIA) was a continuation of it. The whole length of the road from Rome to Ariminum was, according to the Jerusalem Itinerary, 222 miles, and according to the Antonine, 210 miles. Remains of it still exist at various places.

FLAMINIO, flä-mē'nē-ō, MARCANTONIO (1498-1550). An Italian poet, son of Giannantonio Zarabbini di Cotignola, professor at Serravalle (1516-36), who took the name Flaminio. His son was born at Serravalle, and was educated by his father. In 1545 he refused the post of Latin secretary at the Council of Trent, either because of leanings toward Protestantism, or, as seems more likely, because of ill health. He died five years later after a long and painful pulmonary complaint. His complete works, with his father's poems, were published at Padua (1743); they include some rather erotic lyrics, a poetical version of thirty psalms, prose versions of all the psalms and of the twelfth book of Aristotle's *Metaphysics*, and an Italian grammar, *Compendio della volgar grammatica*.

FLAM'INI'NUS. A cognomen of an illustrious branch of the patrician Quinctia gens in ancient Rome, the most famous members of which were the following: (1) QUINCTIUS FLAMININUS (?-B.C. 170). Admiral and general, brother of the more renowned Flamininus described below. He was curule ædile in B.C. 200, and prætor in 199. In the war conducted by Titus Flamininus against Philip, King of Macedon, in 198, Lucius commanded the Roman fleet, with which he sailed around Greece, and, joined by the fleets of Attalus, King of Pergamus, and the Rhodians, laid siege to the city of Eretria, in Eubœa, which was defended by a Macedonian garrison. He soon gained possession of all Eubœa, and then returned to the west coast of Greece, and laid siege to Cenchreæ, the harbor of Corinth; but Corinth itself he was unable to capture. (See MUMMIUS.) In 192 Flamininus was consul with L. Domitius Ahenobarbus. At the end of his year he set out for Gaul as proconsul, ravaging the country of the hostile Ligurians and Boii on his way, and inflicting crushing defeats. His moral conduct at this period disgraced both the man and the high office that he held; and several years later, in B.C. 184, the censor, M. Porcius Cato, arraigned him before the Senate in a most bitter speech, and expelled him from that body. He died in B.C. 170. (2) T. QUINCTIUS FLAMININUS (c. 230-175 B.C.). Brother of the preceding. He was a statesman and general, and the hero of the wars against Philip and Antiochus. He was quæstor in B.C. 199, and consul in 198, without holding the intermediate offices of ædile and prætor. He obtained Macedonia as his field of operations, and set sail from Italy for Greece with a small army of veteran troops. He made Epirus his base, and waited patiently for an opportunity of crossing the mountains and invading Macedonia. When, at length, through the help of a friendly Epirote, the opportunity came, he entered Macedonia and attacked Philip's army in the rear, massacring 2000 men, and driving the rest in the direction of Thessaly. Thessaly next was overrun, and then, making a long detour to the south, he took the towns of Phocis. At the same time, his brother Lucius (see above), in command of the fleet, had induced the Achæan League to take sides with the Romans. Thus the year of Flamininus's consulship had brought great advantages to the Roman cause and weakened greatly Philip's prestige in Greece. The Roman was thus enabled to demand, as a price of truce, that the Macedonian garrisons be withdrawn from the whole of Greece. This price Philip was unwilling to pay. A double commission, accordingly, was sent to Rome, with envoys from Philip and from Flamininus; but the Senate decided to prolong the latter's *imperium*, and gave notice to the former that the Roman general had full authority to prosecute the war to the end. Thus began the second year of the struggle, B.C. 197, which very soon decided the fate of the Macedonian King. The opposing armies met at Cynocephalæ, and the rout of Philip's army was complete. Yet Flamininus would not accede to the demands of his allies that Philip should be dethroned and his kingdom broken up. He contented himself with depriving him of all his possessions in Greece and Asia, and left Macedonia intact. Soon after this he won the enthusiastic applause of the Greeks by declaring, at the Isthmian Games, in the presence of delegates from all of the Greek States, the freedom and independence of all the towns that had been under Macedonian rule. The complete dependence of the Greeks was menaced by Nabis, Tyrant of Sparta, who had been allied with the Romans against Philip; Flamininus therefore brought force to bear upon Nabis, and compelled him to desist from offensive tyranny. In short, when he took his departure from Greece in the spring of B.C. 194, there was no better loved man in all the country than Flamininus, "The Liberator." In 192 a new trouble broke out in the East, and Flamininus returned to Greece. Antiochus, King of Syria, and Nabis, Tyrant of Sparta, were allied against the Romans, but this difficulty was again smoothed over by the tact of the Roman general. When he again returned to Rome, he was made censor, in B.C. 191. We last hear of him as ambassador to Prusias, King of Bithynia, in B.C. 183, when the aged Hannibal (q.v.) was driven to commit suicide for fear of being delivered to the Romans. In 174 his son celebrated funeral games in honor of Flamininus, from which it is supposed that he died early in this or late in the preceding year.

FLAMIN'IUS, Gaius (?-B.C. 217). A Roman general, renowned in the Gallic and Hannibalic wars, and as builder of the Via Flaminia, and of the Circus Flaminius at Rome. Descended from high plebeian stock, he was the most illustrious member of his family. We first hear of him as tribune of the people (*tribunus plebis*), in B.C. 232, when his energies were wholly employed in opposition to the Senatorial or Conservative Party. He proposed and carried an agrarian law for the division among the plebeians of the recently conquered lands of Picenum, and of the Senonian Gauls. As prætor in 227, he received the government of the Province of Sicily, which he administered well. In 223 he was consul with P. Furius Philus, and took the field against the Gauls of northern Italy, who, frightened at the above-mentioned division of Gallic lands and fearing similar attempts on their own territories, had broken into hostilities against Rome. As soon as Flaminius with his army left the city, his political enemies set about to secure the annullment of his election on religious grounds. Just as the consuls were preparing battle with the Insubrian Gauls, a dispatch arrived from Rome with orders to return at once; but it was not opened until Flaminius had gained a signal victory on the banks of the Adda. Upon learning the purport of the dispatch, Furius at once left the field; but Flaminius refused to obey until he brought the campaign to a successful ending. He was summoned before the Senate to answer for his disobedience, but the admiring populace accorded him a triumph. In 221 he was *magister equitum* to the dictator, M. Minucius Rufus; but, owing to an unfavorable omen, both were soon forced to abdicate. In 220 he was censor with L. Æmilius Papus, and constructed the great highway from Rome to Fanum Fortunæ (Fano), on the Adriatic Sea, called after him Via Flaminia. In 218 he gained the further enmity of the conservatives by supporting a proposal of Q. Claudius that senators should have no commercial dealings. Elected consul again for the year 217, he took command of the army to check the advance of Hannibal, and in his haste to leave the city he neglected to observe the customary religious formalities. In order to block Hannibal's march, he led his troops from Ariminum (Rimini) to Arretium (Arezzo), but was caught unprepared on the shores of Lake Trasimenus, and was killed in a three hours' battle, in which 15,000 of his troops perished.

FLAMM, fläm, Albert (1823—). A German landscape painter, born at Cologne, and pupil of Andreas Achenbach at Düsseldorf, where he settled after traveling in Italy. His pictures, the subjects of which are chosen almost exclusively from Italian scenery, command attention by their great truthfulness to nature, careful execution, and lustrous coloring. One of his best productions is the "Approaching Storm in the Campagna" (1862). Among others may be mentioned "Via Appia," in the Kunsthalle at Hamburg, a fine "Italian Landscape" (1856), in the Ravené Gallery, Berlin, and "View of Cumæ" (1881), in the National Gallery, in Berlin. In 1900 the title of professor was conferred upon him.

FLAMMARION, flȧ'mä'rĕ'ôɴ', Camille (1842—). A French astronomer and writer of popular scientific books, in which imagination plays a dominant part. Such are: *La pluralité des mondes habités* (1862; 34th ed. 1890); *Les merveilles célestes* (1866); *L'Atmosphère* (1872); *Uranie* (1889); *La planète Mars et ses conditions d'habitabilité* (1892); and several astronomical and spiritistic romances, and essays, of which *L'inconnu et les problèmes psychiques*, translated into English under the title *The Unknown and Psychic Problems* (1900), is typical. He was born at Montigny le Roi, February 25, 1842, and his combination of mysticism and science results from early theological studies at Langres and Paris, though he left the seminary at sixteen for the Imperial Observatory, where he was a student for four years (1862-65). He became editor of a popular scientific magazine, *Cosmos*, in 1863, and in 1865 scientific editor of a newspaper, *Le Siècle*. He has since been a popular scientific lecturer, and obtained some notoriety for a series of balloon ascents for atmospheric experiments. Most of his works are translated. There is a *Life*, by S. Hugo (Paris, 1891).

FLAMMBURG, Gottfried. See Ebrard, Johannes Heinrich August.

FLAMMERMONT, flȧ'mâr'môɴ', Jules Gustave (1852—). A French educator and historian, born at Clermont (Oise). In 1886 he became professor of history, and of the geography of antiquity and of the Middle Ages, in the faculty of letters at Poitiers, and subsequently was called to a similar chair at Lille. His publications include *Le Chancelier Maupeou et les Parlements* (1884; crowned by the Academy); *Etudes critiques sur les sources de l'histoire au XVIII. siècle* (1886); and *Lille et le Nord au moyen âge* (1888).

FLAM'MOCK'S REBELLION. An outbreak which occurred early in June, 1497, in Cornwall, England, in opposition to the levying of a tax to defray the expenses of the war against Scotland. It was led by one Thomas Flammock, and took the form of a march against London. The insurgents were defeated on Blackheath on the seventeenth of the month, and the leaders were summarily executed.

FLAM'STEED, John (1646-1719). The first astronomer royal of England, born near Derby. He early devoted himself to mathematics and astronomy, and while yet a youth mastered the theory of the calculation of eclipses. His calculations were the means of introducing him to the notice of the eminent scientific men of his time, such as Halley and Newton, through whom he was appointed astronomer to King Charles II. in 1675. The year following the observatory at Greenwich was built for his use, and he began that series of observations that marked the commencement of modern practical astronomy. He formed a catalogue of the fixed stars, and furnished those lunar observations on which Newton depended for the verification of his lunar theory. The *Historia Cœlestis Britannica*, his great work, in three volumes, giving an account of the methods and results of astronomical observation up to his time, was not published till 1725. Consult Baily, *Account of the Rev. John Flamsteed* (London, 1835).

FLAN'AGAN, Roderick (1828-61). An Australian journalist, born in Ireland, but taken by his parents to Sydney at the age of twelve. He learned his trade in a printing-office, was a reporter for the daily papers, started with his brother a short-lived weekly, and afterwards became editor-in-chief of *The Empire*, wherein he advocated the better treatment of Australian aborigines. By 1854 he was on the staff of the Sydney *Morning Herald*, but labored so hard at his *History of New South Wales* that he died from overwork while in London preparing it for publication. The book was issued (1862) after his death, and its comprehensiveness, joined to an unusual breadth of view, will prevent its being soon superseded.

FLANCH'ES, or **FLANQUES**, fläNk. See Heraldry.

FLAND'ERS (Flem. *Vlaenderen*, anciently *Vlaeland*, submerged land). The old name of an extensive region embracing, besides the present Belgian provinces of East and West Flanders, the southern portion of the Province of Zealand, in Holland, and the French Department of Le Nord, and constituting in the Middles Ages a powerful and almost independent principality, ruled by counts under the suzerainty of the French King. Under the Franks, the river Scheldt, which flowed through the district, formed the boundary line between Neustria and Austrasia, in consequence of which the northern and southwestern parts of the territory comprised under the term Flanders, although its population was decidedly Germanic, came to belong to France, while the southeast, although to a large extent non-Germanic, was after 1007 included in the Holy Roman Empire. Flanders obtained its name from the *Vländergau* (*pagus Flendrensis*), the district around Bruges and Sluis, whose counts had been made wardens of the northern coasts of France at the period of the incursions of the Northmen, in the latter half of the ninth century, and who extended the name of their hereditary possessions to the whole district which they governed. The first count, or margrave, of the country is said to have been Baldwin, surnamed Bras de Fer (Iron-Arm), who married Judith, the daughter of Charles the Bald of France, and widow of Ethelwulf, King of England, and received the newly created 'mark,' or county, as a hereditary fief from his father-in-law in 864. Baldwin died about 878. He is said to have inaugurated the industrial greatness of Flanders by introducing into the country great numbers of workmen skilled in the manufacture of woolen and other goods. Baldwin IV. With the Beard, one of the successors of Baldwin Bras de Fer, received in fee from the Emperor Henry II. the burgraviate of Ghent, Walcheren, and the island of Zealand, and thus became a prince of the Empire. He was succeeded by his son, Baldwin V., or the Pious (1036-67), who increased his possessions by the addition of the German territory between the Scheldt and the Dender, belonging to the Duchy of Lower Lorraine. To this he added Tournai, the supremacy over the bishopric of Cambrai (to which, till the erection of the new bishopric of Arras, the County of Flanders had been ecclesiastically subordinate), and the County of Hainaut. During the Middle Ages Flanders figured prominently in the political affairs of Europe—the counts of Flanders being more powerful and wealthy than many European kings. Baldwin IX., the founder of the Latin Empire at Constantinople (see Baldwin I.), died in 1206, leaving two daughters, one of whom died without children; the other bequeathed Hainaut to John of Avesnes, her son by her first marriage, and Flanders to Guy of Dampierre, her son by a second marriage. Meanwhile, the industrial prosperity of Bruges, Ghent, and other cities of Flanders had become so great that the citizens began to feel their own power and to claim independence. They formed republican communities like the free cities of Germany, with this difference, that they admitted the nominal suzerainty of the counts. But they were not afraid to take up arms in defense of their liberties against their nominal masters. Their resistance to arbitrary power took the form of opposition both to the counts of Flanders as their immediate lords (see Artevelde, Jakob van), and sometimes, in conjunction with their counts, to the encroachment of the French King. In 1214 Philip Augustus of France gained a decisive victory at Bouvines (q.v.) over the united forces of John of England, the Count of Flanders, and Otho IV. of Germany. In 1302 a force of 20,000 pikemen under Guy of Dampierre inflicted a crushing defeat at Courtrai on an army of 50,000 French knights, archers, and foot soldiers. It was largely at the instigation of the Flemings that Edward III. of England assumed the title of King of France, and invaded that country, marking the beginning of the Hundred Years' War (q.v.). Through the marriage of Margaret, the daughter and heiress of Louis II., Count of Flanders, to Philip the Bold of Burgundy, in 1369, the country was united to the Burgundian's territories (1384), and afterwards shared the fortunes of that duchy. The dukes of Burgundy brought a greater part of the former Duchy of Lower Lorraine under their domain, and thus laid the foundation for the subsequent union of the States of the Netherlands, in which Flanders continued to form an important part. Under this dynasty Flanders prospered, and the arts were greatly encouraged. On the death of Charles the Bold the Netherlands, which constituted the most flourishing and opulent realm in Europe, passed in 1477 to the House of Hapsburg, by the marriage of his daughter Mary to the Archduke Maximilian. After the Netherlands had passed with King Philip II. to the Spanish line of the House of Hapsburg, the territory of Flanders was considerably diminished: the portion called Dutch Flanders was transferred to the States-General by the Peace of Westphalia, and in the time of Louis XIV. France seized upon other portions of Flanders, and was confirmed in her possession by the treaties of Aix-la-Chapelle (1668), Nimeguen (1678), and Utrecht (1713). By the last, and by the treaty of peace concluded at Rastadt (1714), what remained of the Spanish Netherlands again fell into the hands of the House of Austria. In 1794 Flanders, like the other provinces of Belgium, was incorporated with the French Republic, and afterwards formed part of the Empire, as the departments of Lys and Escaut (Scheldt). The Congress of Vienna united Belgium with Holland to form the Kingdom of the Netherlands. In 1830-32 Belgium

liberated itself from Holland. See Flemish Language; Flemish Literature. Consult: Le Glay, *Histoire des comtes de Flandre jusqu'à l'avénement de la maison de Bourgogne* (Paris, 1842); Kervyn van Lettenhove, *Histoire de Flandre* (5th ed., Bruges, 1898).

FLANDERS, East. A province in the northwest of Belgium, the eastern part of the former County of Flanders (q.v.), bounded on the east by the provinces of Antwerp and Brabant, on the south by Hainaut, on the west by West Flanders, and on the north by the Dutch Province of Zealand (Map: Belgium, B 4). It has an area of 1158 square miles. The surface is low and level, and watered mainly by the Scheldt and by its affluents, the Lys and the Dender. The soil has been rendered extremely fertile by careful cultivation and an excellent fertilizing system. Besides the ordinary varieties of grain, potatoes, flax, hemp, and hops are produced in great quantities. The district in the northeast of the province, between the towns of Antwerp and Ghent, is celebrated as a flax-growing section. The province is one of the principal centres of the linen-weaving and flax-spinning industries. It has also numerous tanneries, besides paper, woolen, and lace mills. The chief exports are lace, linen, and agricultural and animal products. Population, in 1898, 1,025,918, or about 886 to the square mile. Chief towns, Ghent (the capital), Aalst, and Dendermonde.

FLANDERS, West. The westernmost province of Belgium, bordered on the south by France and on the northwest by the North Sea (Map: Belgium, A 4). It has an area of 1249 square miles. In general its surface is flat, low, and in parts marshy. There are sandy hills in the south and dunes along the coast. The Yzer and the Lys are the principal rivers. Numerous canals traverse the province. Agriculture, and particularly stock-raising, flourish, as well as manufactures, chiefly those of linens and laces. Nearly 40 per cent. of the population are engaged in manufacturing. The capital is Bruges. Other important towns are Ypres and Ostend. Population, in 1900, 805,236.

FLANDERS, Henry (1826—). An American lawyer and writer, born in Plainfield, Sullivan County, N. H. He was educated at Kimball Academy and at the Newbury (Vt.) Seminary, studied law, and after 1850 practiced at Philadelphia. He is best known as the author of *Lives and Times of the Chief Justices of the Supreme Court* (2 vols., 1855-58; last ed. 1881), which contains excellent biographical sketches of Jay, Rutledge, Cushing, Ellsworth, and Marshall, and has long been a standard work. Among his other publications are: A *Treatise on Maritime Law* (1852); a *Treatise on the Law of Shipping* (1853); *An Exposition of the Constitution of the United States* (1860); and a *Treatise on the Principles of Insurance* (1871). He published an edition of the *Memoirs of Richard Cumberland* (1856).

FLANDERS, Moll. A profligate woman, the subject of De Foe's *Fortunes of Moll Flanders.*

FLANDIN, fläɴ'dăɴ', Charles (1803-91). A French chemist, born at Aubues. In 1829 he was *interne* in Paris, and three years afterwards published his remarkable work on cholera. From that time he was best known as a toxicologist. His most important works are *De l'arsenic* (1841) and *Traité des poisons* (1846-53). His discoveries in regard to the action of sulphuric acid in carbonizing organic substances led him into a long and bitter polemic with Orfila.

FLANDIN, Eugène Napoléon (1809-76). A French painter and archæologist, born in Naples. After painting several fairly successful pictures, Flandin was sent on an archæological mission to Persia, with the architect Pascal Coste, and stayed in that country from 1839 to 1841. The valuable discoveries made there he published in a *Voyage en Perse* (1843-54; 6 vols., 665 plates). He also designed the plates for Botta's works on Nineveh and Khorsabad, and published himself *Le monument de Nineve* (1849-50); *L'Orient* (1853-74); and *Histoire des chevaliers de Rhodes* (1867-73). He is known now only for his valuable discoveries in history and archæology.

FLANDRIN, fläɴ'drăɴ'. A family of French painters. Hippolyte (1809-64) was the leading member of the family, and one of the greatest religious decorators of the nineteenth century. He was the second son of a miniature painter, and was born in Lyons. He was taught by his father, and in the art schools of Lyons. In 1829 he went to Paris on foot, with his brother Paul, and entered the atelier of Ingres and the Ecole des Beaux-Arts. During all their student days the brothers lived in distress and poverty. In 1831 Hippolyte entered for the first time the competition for the Prix de Rome, and was admitted to the preliminary trial, but not to the final one. The next year (1832) he was successful, and won the first Prix de Rome with the subject "The Recognition of Theseus by His Father." Some of the pictures painted at this time are among Flandrin's most interesting compositions. The picture of "Dante and Vergil" won a gold medal in the Salon of 1836. Soon after he settled in Rome, Flandrin devoted himself definitely to religious painting. In 1839 he returned to Paris. In 1840 he received a commission for the decoration of the Chapel of Saint John in the Church of Saint Severin in Paris. The success of this work brought the very important commission for the decoration of the famous old Church of Saint-Germain-des-Prés in Paris, which had been recently restored. He painted two compositions on the walls of the church. In 1846 he was further commissioned to paint the choir of this church. Flandrin decorated also the new Church of Saint Paul in Nîmes, which had been built by the architect Quesnel. This work was followed by the decoration of the three apses of the church of the Abbey of Ainay in Lyons.

In 1848 he received the commission for his most important work, the decoration of the great Church of Saint Vincent de Paul, built by the architect Hittorff in Paris. The work was at first offered to Ingres, and afterwards to Paul Delaroche. Refused by both, the commission was finally given to Flandrin. The long frieze between the two superimposed arches, representing a procession of saints, is his chief work, and one of the finest things in modern figure decoration. At the time of his death Flandrin had projected decorations for the Cathedral of Strassburg, and for the Church of Saint-Augustin in Paris. He painted about fifty or sixty portraits and a small number of easel pictures. Among his portraits were those of Napoleon III., Prince Jerome Napoleon, Duchâtel, Mlle. Maison, and M. Say. He was made officer of the Legion of Honor and member of the Academy in 1853, and professor of painting in the Academy in 1857. He died in Rome, March 21, 1864. His correspondence was published after his death by Delaborde, under the title, *Lettres et pensées d'Hippolyte Flandrin* (Paris, 1865).

Auguste (1804-1842), the elder brother of Hippolyte. He studied at the Ecole des Beaux-Arts in Lyons, and became a lithographer. In 1832 he joined his brothers in the atelier of Ingres in Paris, and visited Italy. Returning to Lyons, he was made professor at the Ecole des Beaux-Arts and taught the doctrines of Ingres for many years.

Jean Paul (1811 —), the younger brother of Hippolyte, studied at the Ecole des Beaux-Arts in Lyons. He followed his brother to Paris, studied with Ingres, and went to Rome in 1834. He exhibited at the Salon frequently, and won several medals, but spent most of his life as the assistant of his brother Hippolyte. After the latter's death he finished the decorations of the nave of the Church of Saint-Germain-des-Prés from his designs. He was employed independently in the Church of Saint-Severin, the Palace of the Legion d'Honneur, and at the Luxembourg. He painted many landscapes.

Consult: Saglio, "Hippolyte Flandrin," in *Gazette des Beaux-Arts* (Paris, 1864); Arlich, "Hippolyte Flandrin," in *Fine Arts Quarterly Review*, vol. v. (London, 1866); Poncet, *Hippolyte Flandrin* (Paris, 1864); Clément, *Etudes sur les beaux-arts en France* (Paris, 1865); Blanc, *Les artistes de mon temps* (Paris, 1876); Lear, *A Christian Painter of the Nineteenth Century* (London, 1875); Beulé, *Notice historique sur la vie et les ouvrages de M. H. Flandrin* (Paris, 1869); Gautier, *Portraits contemporains* (Paris, 1872).

FLANGE (later form of *flanch*, from *flank*, OF., Fr. *flanc*, ML. *flancus*, flank, from OHG. *hlanca*, flank, dialectic Eng. *lank*, groin). A projecting rim, rib, or ridge, on any object, as the ridge on the inner edge of a car-wheel or the rim on the end of a cast-iron pipe. A railway rail is made up of a head, a web, and a base, and the base is formed by two flanges; a steel I-beam has a vertical web and a horizontal top and bottom double flange. Flanges are employed on a multitude of objects, of which those named are merely familiar examples. See Rolling-Mill, especially the paragraph on steel shapes.

FLANK (OF., Fr. *flanc*, flank). In military formations, a wing or extremity. Flank files, companies, battalions, or regiments are the troops on the right and left extremities of the main body. The flank is a source of weakness to the front in proportion to its length and vulnerability; and of strength if protected by the natural conformation of the terrain, in that it releases a larger force for the front, or wherever the danger threatens. A flanking or turning movement, owing to the danger and cost of frontal attack, is now a movement of supreme importance. See Attack; Tactics, Military.

FLANNEL (OF. *flanelle*, of doubtful origin, possibly connected with OF. *flaine*, pillow-case, which seems to be derived from the Celtic; Ir. *olann*, wool, Welsh *gwlân*, Corn. *gluan*, Bret. *gloan*, linen, Lat. *lana*, Eng. *wool;* with Fr. *fl* for Celt. *ve*, as in Fr. *flèche*, arrow, from Ir. *flesc*). A woven fabric used chiefly for underclothing and other garments. Flannels are usually made of wool, with which may be combined or woven silk, linen, cotton, or worsted yarns. They are dyed in all shades of solid colors, and many are printed or embroidered with various designs and patterns. Vegetable or chemical coloring agents are largely used for dyeing, and in recent years the variety and brilliancy of coloring has been greatly increased. All-wool flannels, which were largely used years ago by working people, have not been manufactured recently so extensively, owing to the cheaper and more attractive fabrics produced by the admixture or use of cotton, although all-wool blue and scarlet flannels are still used largely by firemen, miners, sailors, and laborers. French flannels are made of wool and worsted, or wool with silk warps in various grades, and are extensively used for women's garments. Canton flannels, so called, although made entirely of cotton, have the face of the goods carefully napped or teasled. The fibres are fulled or felted and combed out so as to make a soft and fleecy surface. Outing flannels are loosely woven fabrics of cotton which have been manufactured within the past twenty years, and have a napped face, and are made in many designs with attractive colorings. Domett flannels are made with cotton warp and woolen filling, being manufactured in both plain and fancy colorings.

For detailed description of manufacture of flannels and other fabrics, see Woolen and Worsted Manufacture.

FLANNELMOUTH. A local name in the United States for (1) the great fork-tailed catfish (*Amiurus lacustris*) of the Mississippi Valley; and (2) a sucker (*Catostomus latipinnis*) of the Rio Colorado and its tributaries.

FLASH, Sir Petronel. An adventurer, who wished to forsake town and trouble for Virginia and bucolic content, in Chapman, Marston, and Jonson's *Eastward Ho*.

FLASSAN, flȧ'säɴ', Gaetan Raxis de (1760-1845). A French diplomat and historian. He was born at Bedouin (Vaucluse), and received a military education in Paris. He was professor of history at the military Academy at Saint-Germain, and in 1814 was a member of the French embassy in Vienna. His principal work is the *Histoire générale de la diplomatie française depuis la fondation de la monarchie jusqu'au 10 Août 1792* (7 vols., 1811).

FLAT (Icel. *flatr*, OHG. *flatz*, flat). A musical character, shaped thus ♭, which, when placed before a note, lowers that note half a tone. If this note, or its octave, occurs more than once within the same bar it is always played flat, although not again marked. When the original natural tone is to be played again in the following bar it is customary to mark it with a natural (♮). The *double flat* (♭♭) lowers a note two chromatic half-tones.

FLAT. A floor or story in a building, fitted up especially for a dwelling, so that each suite of apartments contains all the requirements of a home. A single floor is often divided into two or more apartments; and four, six, or even more of these dwellings open upon one stairway.

This system has long been in use in Europe, and particularly on the Continent, but recently has been more commonly adopted in England and America, not only for the poorer classes, but also among the rich. In New York, especially in the uppermost part, and other American cities many elegant buildings have been erected of late years, which far surpass anything of the kind in Europe. The size of such buildings, as well as their convenience, is increasing each year. Each suite has its private hall, extensive drawing-rooms, dining-room, butler's pantry, bath, kitchen with all conveniences, electric bells, and elevators. In some American cities, especially New York, local usage distinguishes between a *flat* and an *apartment,* restricting the former term to the cheaper suites of rooms, in which there is no elevator, hall service, or restaurant, each or all of which conveniences may be looked for in an 'apartment.' See APARTMENT HOUSE.

FLATBUSH. A residential section of Brooklyn (q.v.).

FLATEYJARBOK, flăt′å-yär′bôk (Icel., book of Flatey). A manuscript collection of sagas connected with the times of the Norwegian kings Olaf Tryggvason and Olaf the Saint, once owned in the Icelandic island of Flatey, now in the Royal Library in Copenhagen. It is the work of two Icelandic priests (1380-95), and is important as one of the chief sources for the Norse discovery of America.

FLATFISH. A general name for a large and important group of marine acanthopterygious fishes constituting the suborder Heterosomata, and embracing the families Pleuronectidæ (flounders) and Soleidæ (soles). They have much compressed bodies, swim upon their sides, near the bottom, and all have the fore part of the skull twisted so as to allow of two eye-orbits on the same side, one vertical and one lateral. See FLOUNDER; SOLE; TURBOT, etc.

FLATHE, flä′te, HEINRICH THEODOR (1827-1900). A German historian, born June 1, 1827, at Tanneberg in Saxony. He studied philology and history in the University of Leipzig, and in 1866 became a professor in the Fürstenschule at Meissen. He retired from active life in 1895, and died March 26, 1900. Flathe was an indefatigable writer and editor, his special field being Saxon and modern history. He published numerous monographs in Weber's *Archiv für sächsische Geschichte.* He prepared for the Heeren and Ukert series a new edition of E. W. Böttiger's *Geschichte des Kurstaates und Königreichs Sachsen* (1867-73). His own writings include a history of the Fürstenschule at Meissen (1789); *Katechismus der allgemeinen Weltgeschichte* (1884); *Das Zeitalter der Restauration und Revolution, 1815-51,* in the well-known Oncken series (1883); *Deutsche Reden, Denkmäler zur vaterländischen Geschichte des 19ten Jahrhunderts* (1893-94); and contributions, in three volumes, under the title *Die neueste Zeit* (1887-92), to the *Allgemeine Weltgeschichte,* by Flathe, Hertzberg, and others. An American translation of *Die neueste Zeit,* with extensive additions, was announced in 1901. Flathe's historical writings are marked by careful investigations of the sources and impartial treatment.

FLATHEAD. A fish, the barramunda (q.v.).

FLATHEAD, or SALISH. An important Salishan tribe, and the one from which the stock takes its name, formerly holding the mountain region of northwestern Montana and centring about the lake and river of that name. Among the early explorers and traders they were noted for their friendly and honorable character, and because, while not aggressive, they bravely defended themselves against the inroads of their enemies, the Blackfeet. Singularly enough, they never had the custom of flattening the head, as their popular designation would imply, the name arising from the fact that the more western tribes on the Columbia, which practiced this custom almost universally, considered themselves in consequence as having *pointed* heads, and therefore distinguished the Salish, whose skulls were not thus deformed, as 'flatheads.' The Jesuit missionary De Smet began work among them in 1841, founding the mission of Saint Mary, long known as the most successful Indian mission in the Northwest. Together with the confederated Pend d'Oreille and a band of Kutenai Indians they are now gathered upon the Jocko reservation within their ancient territory, the combined tribes numbering 1280.

FLAT′MAN, THOMAS (1637-88). An English poet and painter, born in London. He was educated at Winchester and Oxford, and was called to the bar, but gave up law to follow art and literature. His *Poems and Songs* (1674) were well received, but his miniatures are more valued at the present day, notably that of himself in the Dyce collection, South Kensington Museum. He was credited with the authorship of certain satirical works in prose, and he undoubtedly inspired Pope's *Dying Christian* by his own "A Thought of Death," one of the *Poems and Songs.*

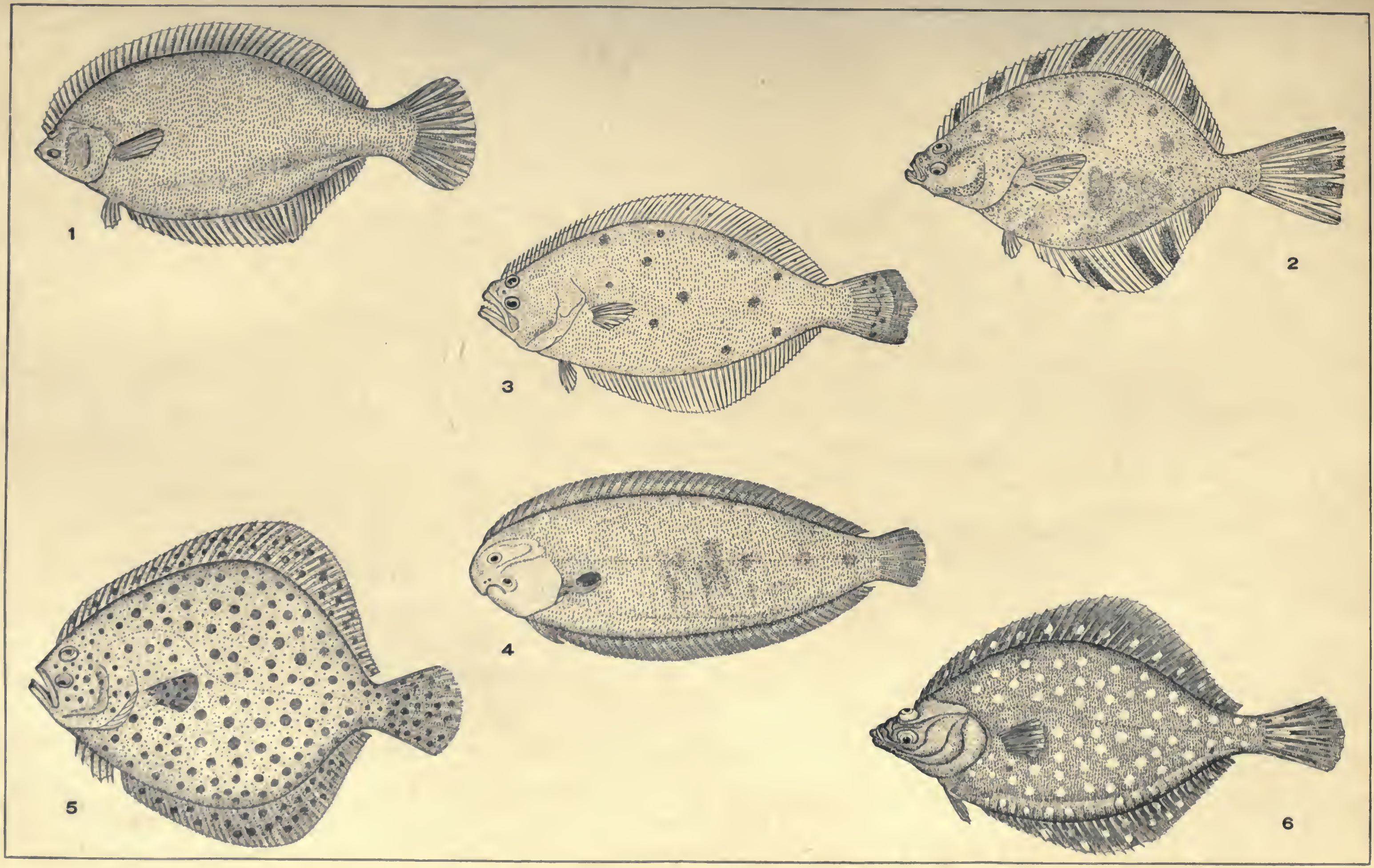
FLATTERS, flå′târ′, PAUL FRANÇOIS XAVIER (1832-81). A French officer and explorer, born at Laval, a son of Jean Jacques Flatters, the sculptor. He took part in the Crimean War, and was made lieutenant at Sebastopol; distinguished himself in the Italian campaign (1859), and was captured at Sedan. After eight years of service in Algeria he was ordered by the Government to act on a commission to consider the feasibility of building a railroad connecting Algeria with the Sudan. His first expedition, which started in 1880, got as far as Lake Menkhugh, and turned back just in time to escape the Tuaregs, sent out to kill them. The second trip began in the latter part of the same year, and was probably watched all the way by Berber spies. Six hundred men from three Tuareg tribes met the party at Bir-el-Gharama, lured Flatters away and killed him, and later massacred most of the party. The official record of the expedition was lost, but some of Flatters's papers were preserved, and they are the basis of much of our knowledge of the Sahara. Consult Brosselard, *Les deux missions Flatters* (Paris, 1889).

FLATTERY, CAPE. See CAPE FLATTERY.

FLATULENCE (from Neo-Lat. *flatulentus,* flatulent, from Lat. *flatus,* a blowing, from *flare,* to blow, OHG. *blājan,* Ger. *blähen,* AS. *blāwan,* Eng. *blow*). Distension of the stomach or bowels by the gases formed during digestion. See INDIGESTION.

FLATWORM. A general name for a group of worms constituting the phylum Platyhelminthes

FLATFISH AND FLOUNDERS



1. COMMON OR WINTER FLOUNDER (Pseudopleuronectes Americanus).
2. GREAT FLOUNDER (Platichthys stellatus).
3. SUMMER FLOUNDER (Paralichthys dentatus).
4. ENGLISH SOLE (Solea vulgaris).
5. TURBOT (Rhombus maximus).
6. PLAICE (Pleuronectes platessa).

(q.v.), and embracing the planarians, flukes, tapeworms, and nemertineans. The body in almost all cases is greatly flattened, so as to be leaflike or ribbon-like, with a forward end marked in some way, though a head is rarely distinct, and right and left sides; some are minute, others easily visible, or like long narrow ribbons. Some are vividly colored, but most are of dull hue, and there is a varying complexity of structure and great diversity in habits of life. In development some are direct, while others go through a metamorphosis. They are the most widely distributed of any phylum, dwelling "on land, in fresh water down to the bottom of some of the deepest lakes, on the seashore, in deep sea, and on the surface of the ocean; and parasitic flatworms live, in one phase or another, in animals of nearly every class of the Metazoa." They are regarded as having been developed from some low ancestral type of cœlenterates. Consult Parker and Haswell, *Text-Book of Zoölogy* (London and New York, 1897); Gamble, *Cambridge Natural History*, vol. ii. (London, 1896). See Fluke; Nemertinea; Planaria; Tapeworm.

FLAUBERT, flō'bâr', Gustave (1821-80). A French novelist. He united the minute realistic vision of Balzac with very great rhetorical skill, and devoted his life to the production of five volumes of rare literary art. But the importance of *Madame Bovary* (1857), *Salammbô* (1862, well translated by J. W. Matthews, 1891), *L'éducation sentimentale* (1869), *La tentation de Saint-Antoine* (1874), the *Trois contes* (1877), and the unfinished *Bouvard et Pécuchet* lies not only in their faultless style, but in the precision with which they enunciate a view of the art of fiction that was to dominate the succeeding generation. *Madame Bovary* gave "the formula of the modern novel" (Zola), the code of the naturalistic school. Flaubert was born in Rouen, December 12, 1821, the son of a surgeon, and inherited a power of psychic diagnosis and dissection. His vocation for literature was unmistakable. He was wealthy, able to cultivate his taste by travel, and to produce at leisure. His early influences were strongly romantic, fostered by a violent love affair with a lady whom he has pictured as Madame Arneux in *L'éducation sentimentale*, and by a tenderly platonic attachment to Madame Colet. Hating democracy and wishing to hide the epilepsy to which he was subject, he became more and more a recluse. Except for literary journeys to the East, particularly to Carthage, he spent his life at a suburban house in Rouen, cloistered for months together in unremitting study, relieved by occasional visits to Paris, where he gave free scope to a Rabelaisian fancy in the society of the Goncourts, whose *Journal* is filled with his sayings. In general he affected, and in good measure attained, an objective attitude toward life, which, he says, appeared to him as material for description, an end in itself; and he is thus the type of the artist for art's sake. *Madame Bovary* is the epic of the commonplace, the bitterest satire on romanticism. In it sentiment leads to shipwreck, self-sufficient mediocrity to success. *Salammbô* applies the same method and philosophy to the civilization of ancient Carthage; *L'éducation sentimentale* to the Paris of 1848, seeking to be 'implacable,' and becoming unjust, but producing what Zola pronounces "the only truly historical novel that I know in which the resurrection of dead hours is absolute, with no trace of the novelist's trade." In *La tentation de Saint-Antoine* Flaubert pushed the paradox to its extreme, and in three hundred pages of the most polished prose of his century sought to express the essential folly and futility of thought itself and of the whole sentient world. *La tentation* is the supreme expression in fiction of nihilistic pessimism, of the idealist turned skeptic, and withal the best example of dream-literature in the world. The *Trois contes* show Flaubert's genius epitomized. There is pathos of sordid commonplace in *Un cœur simple;* a remarkable power of projection into other realms of thought and life is in *La légende de Julien l'hospitalier*, and in *Hérodias* there is a grandiosely romantic realism. These three tales would alone suffice to define Flaubert's place as the connecting link between the romantic and the naturalistic schools. Belonging to neither, he unites both in a synthesis of romanticism and science that was to guide the development of the French novel for a generation. He died at Croiset, May 8, 1880. Consult: Tarver, *Gustave Flaubert as Seen in His Works and Correspondence* (London, 1895); Faguet, *Flaubert* (Paris, 1899).

FLAUGERGUES, flō'zhârg', Honoré (1755-1830). A French astronomer, born at Viviers, where he lived and died, never leaving the town. He refused an offer of the directorship of the Observatory of Toulon in 1797, preferring, it is said, to be justice of the peace in Viviers. His contributions to various technical journals from 1790 to 1830 dealt with the satellites of Jupiter, Saturn's ring, the spots and markings on Mars, and especially with comets. He discovered the great comet of 1811.

FLAUX, flō, Armand de (1819—). A French author, born at Uzès. He published two volumes of verse, *Nuits d'été* (1850), *Sonnets* (1864), and descriptive works on Tunis, Denmark, and Sweden, whither he had been sent upon literary missions by the Government.

FLAV'EL, John (c.1630-91). An English Nonconformist divine. He was born at Bromsgrove, Worcestershire; was educated at Oxford, and became curate at Deptford in 1650, and at Dartmouth in 1656. Under the Act of Uniformity he was ejected from his living, but he continued to preach privately. After 1687 he was minister of a Nonconformist church at Dartmouth. Among his popular writings on practical religion is *Husbandry Spiritualized* (1669). His collected writings appeared in six volumes (Newcastle, 1797), and selections, edited by Bradley (London, 1823).

FLA'VIAN (Lat. *Flavianus*), Saint (?-404). Patriarch of Antioch, 381-404. He led an ascetic life, devoted his property, which was considerable, to the Church, became an influential member of the Meletian party in the contest with the Eustathians (see Eustathius; Meletius), and was chosen by the former to succeed Meletius as Patriarch in 381. The Eustathians strove for the recognition of Paulinus, who had already been set up in opposition to Meletius, and a bitter contest ensued. In 387 a serious sedition occurred in the streets of Antioch, and the statues of the Emperor Theodosius were overthrown. Flavian journeyed to Constantinople, and his influence was sufficient to prevent the punishment of the rebellious people. It was then that Chrysostom's famous *Orations on the Statues* were delivered. After 392 Flavian had no rival claimant for the patriarchate, although some of the Eustathians continued to oppose him till his death. None of his writings have survived. His day in the Greek Church is September 26th.

FLAVIAN, SAINT (?-449). Patriarch of Constantinople, successor to Proclus in 446. He was deposed in 448 by the Council of Alexandria, and he is supposed to have died from injuries inflicted by Dioscorus, the president of the council, August 11, 449, at Hypæpa, in Lydia. He is enrolled in the martyrology of the Latin Church, his day being February 18th.

FLAVIAN, SAINT (?-518). In early life a monk, he became Patriarch of Antioch in 498; was deposed in 512, and banished to Petra, in Arabia, where he died, July, 518. He wavered in his faith, yet died in the odor of orthodox sanctity, and was enrolled among the saints of the Greek Church, and also, after considerable opposition, among those of the Latin Church. His day is July 4th.

FLAVIAN EMPERORS. A term used to designate the three Roman emperors, Vespasian (q.v.) and his two sons, Titus (q.v.) and Domitian (q.v.).

FLAVIGNY, flȧ′vē̇′nyē̇′, MARIE CATHERINE SOPHIE DE. See AGOULT.

FLA′VIN (from Lat. *flavus*, yellow). A yellow coloring matter employed in the dyeing of wool. It is obtained from quercitron (q.v.), by boiling with dilute acids. The coloring substance of flavin is *quercetin*, $C_{24}H_{16}O_{11} + 3H_2O$, flavin being the commercial name of this substance in the impure state.

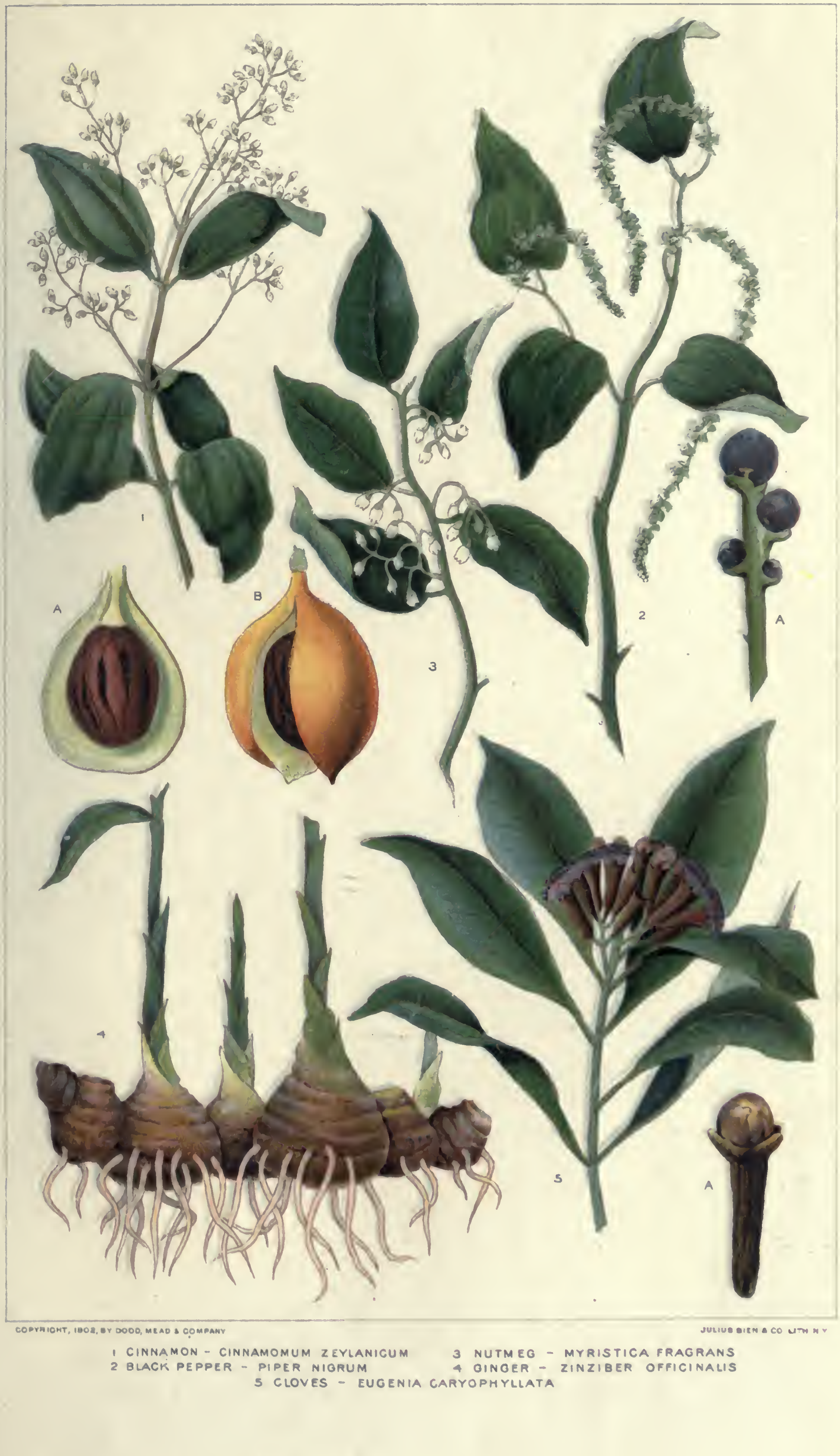
FLAVIO, flä′vyō̇, BIONDO, or BIONDA DA FLORIÌ (1388-1463). An Italian historian and antiquary. He was born in Rome and studied under Ballistario of Cremona. Afterwards he became secretary to Popes Eugenius IV., Nicholas V., Calixtus III., and Pius II. His principal works, which are still regarded as valuable sources by the student of Roman history and antiquities, include: *Romæ Instauratæ Libri Tres* (1482); *Romæ Triumphantis Libri Decem* (1482); *Italia Illustrata* (1474); *Historiarum ab Inclinatione Romani Imperii ad Annum 1440, Decades III., Libri XXXI.* (1483).

FLAVORING PLANTS (from *flavor*, OF. *flaveur*, odor, ML. *flavor*, yellow gold, yellowness, from Lat. *flavere*, to be yellow, from *flavus*, yellow). Plants which impart their characteristic flavors to condiments, culinary preparations, beverages, medicines, etc., with which they are mixed. Usually the part richest in the flavor is employed either in its native state or prepared in some way. The following examples will illustrate: The bark of the root (sassafras); the root (licorice); rhizome (ginger and peppermint); bark (cinnamon); leaves (bay and culinary herbs, such as sage, thyme, etc.); flower-buds (cloves, capers); flowers (hops); arillode of the seed (mace); rind of the fruit (citron, etc.); unripe fruit (allspice); fresh ripe fruit (lemon); dried ripe fruit (vanilla, pepper); seed (nutmeg, caraway). Many of these owe their powers to essential oils, which in some cases are extracted and used in a similar manner; flavors of others are due to esters, alkaloids, etc. Spices, a group of flavoring plants, are almost wholly tropical in their origin, and were formerly grown in and exported from the East. Arabia was at one time noted as the land of spices, not so much because spices were produced there as because that country was the great distributing centre. Tropical America, which has made some notable additions to the list of flavoring plants, e.g. Cayenne pepper and vanilla, has developed a profitable industry in the growing and the exporting of certain Asian spices, especially ginger and cloves.

The five spices illustrated herewith are treated more fully under their respective names. (1) Cinnamon is the dried bark of *Cinnamomum Zeylanicum*, and of its close relatives, trees which grow in the East. The species figured is a native of Ceylon, which is cultivated in many other tropical countries, but nowhere else produces bark of such high quality. (2) Black pepper, the most widely used of all spices, is the dried fruit of *Piper nigrum*, a native of the East Indies, but cultivated in other tropical countries. The stems, which are vine-like and seldom grow more than twenty feet long, spread so much that poles or trees are used to support them. The plants produce a profusion of mostly hermaphrodite flowers in spikes opposite the leaves. The crop is gathered as soon as the first berries become red, and is ready for export after drying. (3) Nutmeg is the kernel of the fruit of *Myristica fragrans* or *moschata* and other related species, trees indigenous to the East, but cultivated in the tropics throughout the world. The succulent golden-yellow pear-like fruit opens by two valves and exposes the kernel as shown. These exterior parts, which look like candied fruit, are often preserved as a confection. The inner envelope which surrounds the nut is used in cookery under the name of mace (q.v.). (4) Ginger, the creeping rootstocks of various species of Zingiber, of which the commonest is *Zingiber officinale*, is used as a condiment and a medicine, for which purposes it is cultivated in and exported from various tropical countries, especially the West Indies. The finest quality is said to come from Jamaica. The common species is a native of the East Indies, where it has been cultivated for hundreds of years. (5) Cloves are the dried flower-buds of the clove-tree (*Eugenia caryophyllata*), a pyramidal evergreen often forty feet tall in its native home, the Spice Islands. The leaves, flowers, and bark are aromatic, and the olive-like fruit, which is exported to a small extent under the curious name of 'mother of cloves,' has a similar but weaker odor and flavor. See HERBS, CULINARY.

FLAX (AS. *fleax*, OHG. *flahs*, Ger. *Flachs*; probably connected with Goth. *flahta*, hair-plait, Ger. *flechten*, to weave, Lat. *plicare*, to fold). An annual plant of the genus Linum (order Linaceæ), of which there are more than one hundred known species, mostly annual and perennial herbs, scattered over the globe. They are most abundant in Europe and northern Africa. The common flax (*Linum usitatissimum*) is an annual indigenous to the Mediterranean region of Europe and Africa and to some parts of Asia, but now distributed over both hemispheres. This most common species of flax has a very slender, erect stem, two to three feet tall, branching only near the top, which bears beautiful blue, or sometimes

FLAVORING PLANTS



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1 CINNAMON - CINNAMOMUM ZEYLANICUM
2 BLACK PEPPER - PIPER NIGRUM
3 NUTMEG - MYRISTICA FRAGRANS
4 GINGER - ZINZIBER OFFICINALIS
5 CLOVES - EUGENIA CARYOPHYLLATA

white, flowers. The seeds are dark brown, glossy, flattened, with acute edges.

No plant not yielding food to man is more useful than the flax-plant. It is highly valuable both for the fibres of its inner bark and for its seeds. Flax-fibres are characterized by length, fineness, solidity, and suppleness. Their length is invaluable in spinning, and the nature of their surfaces prevents them from slipping on each other, thus contributing to the durability of fabrics made with them. When separated from both the bark and the inner woody portion of the stem they constitute the well-known material from which linen thread and cloth are made, and they are used for manufacturing the finest and the coarsest fabrics, the most delicate and exquisite lace, linens, shirtings, and handkerchiefs, twines for shoemakers and harness-makers, cords for the warp of carpet and the body of oilcloth, sailcloth, rope, and cordage. The seeds yield by expression the drying fixed oil called linseed oil (q.v.), used for mixing paints, varnishes, etc. The remaining crushed mass is linseed cake, or oilcake, esteemed for feeding cattle, and which, when finely ground, becomes linseed meal. Linseed is sometimes used in medicine as an emollient and demulcent in irritations of the mucous membranes generally, but especially of the pulmonary and urinary organs. Flax has the advantage of giving employment not only to an agricultural but to a manufacturing population. In no European country is it more successfully cultivated than in Belgium, where it is employed in the manufacture of the famous Brussels lace, the crop when prepared for market sometimes exceeding in value the land on which it was produced. The excellence of Belgium flax must be ascribed largely to the great care bestowed on its cultivation.

FLAX.

HISTORY. Flax has been cultivated from the earliest historic times. It is mentioned in the Book of Exodus as one of the products of Egypt in the time of the Pharaohs, and microscopic examination has shown that the mummies of Egypt are enveloped in linen cloth. As in the days of Solomon, who purchased linen yarn in Egypt, and as in the time of Herodotus, who wrote of the great Egyptian flax trade, Egypt still grows large quantities of flax. In Europe its cultivation is very extensively carried on, especially in Russia, Belgium, and Ireland. In America it has been cultivated since the period of earliest settlement. During the Civil War in the United States efforts were made in some quarters to substitute it for cotton, the supply of which was cut off. But since the two fibres demand essentially different treatment, and since the machinery employed in the manufacture of cotton fabrics is not adapted to the manufacture of linen fabrics, the experiments were not satisfactory. For its fibre the culture of flax is attracting increased attention in the United States, and it is being produced in small quantities for this purpose in Michigan, Wisconsin, Minnesota, and Washington; for its oil it is largely grown in many States. From time immemorial flax has been cultivated in India for its seed, but not for its fibre. In that climate the plants seldom exceed eighteen inches in height and are much branched, yielding a worthless fibre, but a large quantity of seed richer in oil than the European or the American seed.

CULTIVATION. Flax will grow in almost any part of the United States, but it needs a strong, rich soil and careful manipulation at every stage of its production and manufacture. The heavier soils, when well drained and of proper fertility, are preferable to sandy loams; wet soils will be fatal to success. In general, a deep, moist, strong loam upon upland and free from weed-seeds, which must be avoided above all things, will give best results. As far as possible weeds should be eliminated by previous cultivation. Flax is believed to make heavier demands upon the soil than does any other crop, and for this reason it is frequently called exhaustive. In Belgium and other flax-growing countries, where land has been under cultivation for generations, stable manure, which has been well rotted to avoid the danger of fouling the land with weeds, is applied before winter sets in. Previous to sowing time in spring the ground is heavily treated with fertilizers.

Flax demands a greater amount of labor than almost any other crop, and unless extreme care be exercised in every step the value of the crop for fibre will be seriously impaired. Much depends on the thickness of sowing. For a fine fibre flax must be sown thickly and be pulled before the seed is ripe; for a coarse fibre it may be given more room and the seed allowed to reach approximate maturity, but not the hard stage known as 'dead ripeness.' Coarse fibre and a crop of seed are often preferred by the grower to a crop of fine fibre alone, a departure that experience at home and abroad will countenance, especially since the disproving of the assertion that good fibre and seed cannot be produced by the same plant. Still, flax should be grown with a view of getting from the land a fine quality of fibre, while the seed, which ought to be a factor of profit, should be saved. Usually the crop is pulled, roots and all, by hand, but if the ground be smooth it may be cut with a mower, the implement used when seed alone is passed through an ordinary threshing-machine;

but since this tangles and breaks the fibre, it must not be used if the fibre is to be saved.

Dressing. The process first gone through after pulling is *rippling,* which consists in tearing off the seeds by pulling the stalks through a flax-comb, which consists of a series of iron teeth 18 inches long, placed within a distance of half an inch of each other. These are fastened in a block of wood, which is placed at the end of a plank or long stool, on which the operator sits. Often the seeds are separated from the stalk by threshing or hammering, but this process, as already stated, is objectionable, as it soils and breaks the stalk. The next process is to obtain the flaxen fibre or lint, free from the woody core or *boon* of the stem. This is effected by steeping the bundles in either stagnant or running water till the boon begins to rot, in which state it is readily separated from the fibre. The operation is called rotting, or *retting,* and requires to be managed with great care, as by continuing it too long decomposition might extend to the fibre, and render it useless; while by discontinuing it too soon the separation could not be effected with sufficient ease. The time is generally determined by the nature and temperature of the water and the ripeness of the flax, decomposition taking place more rapidly in soft, stagnant water than in running streams, in which the retting is sometimes conducted. Three natural modes of steeping, or retting, the straw are recognized—dew-retting, pool-retting, and retting in running water. There are also many processes for quick retting, where the temperature of the water is controlled, and also where cereals are used; but the flax of the world is largely retted by natural methods rather than by 'processes.' For dew-retting a moist meadow is the proper place, the fibre being spread over the ground in straight rows at the rate of a ton to an acre. For pool-retting the softest water gives the best results, and where a natural pool is not available, such as the 'bog-holes' in Ireland, 'steep holes' are made. The sheaves are kept entirely under water, but without touching the bottom. The fibres sink when decomposition has been carried to the proper point. If the woody portion or core pulls out easily, leaving the fibre intact, it is ready to come out. The operation usually requires from five to ten days. Dew-retting is the safest and least offensive method, but it requires much longer time, and in a country where land is valuable would become very expensive. On the whole, the mixed method of retting is preferable—that is, to steep till decomposition of the boon is well advanced, and then to complete the process on the grass. It has been attempted to separate the fibre by machinery, without subjecting the flax to retting; but the article so produced has hitherto been rejected as inferior in quality.

Attempts to hasten the process of retting by placing the flax in tanks and using warm water or steam instead of cold water or dew have been more successful. According to the process introduced by Schenk, the flax is placed in vats, in which it is kept down by means of strong framework. Water is allowed to pass into the vats, to become absorbed by the flax; steam is next admitted, till the temperature of the water is raised to, and maintained at, about 90°. Acetous fermentation ensues in a few hours, and after being maintained for about 60 hours, the decomposition of the gummy or resinous matter in the stalk is completed. The mucilage water is next withdrawn from the vat, and the flax taken out, separated, and dried, either in the open air or in desiccating-rooms, according to circumstances. Retting in water is usually followed by bleaching on the grass, to secure an even color. This is often accomplished in a few days, but may require several weeks.

The whole process of retting is a typical fermentation. A disagreeable odor arises from the fermenting flax, and the liquid, after the fermentation, is filled with products which make valuable manure. The bacillus which produces the retting has been identified, and it has been shown that the retting is a process of decomposition of the pectin cement. No method of separating the linen fibres in the flax from the wood fibres has yet been devised which dispenses with the aid of bacteria. (See Conn, *Story of Germ Life,* New York, 1900.) In chemical retting, however, dilute sulphuric or hydrochloric acid is used which completes the process in a few days.

The flax is now ready to be freed completely of its woody particles. This is effected by *scutching.* Previous to this, however, the flax is passed through a *brake,* or revolving rollers, in order thoroughly to crack the boon. The brake, worked by manual labor, consists of a frame, on the upper side of which are a number of grooves; a movable piece is hinged at one end, and provided with a similar grooved piece on its lower side, but so placed that the projections pass into the hollows of the lower. The flax, placed between these, and struck by bringing down the hinged part, is broken, but the fibre remains uninjured.

In the flax-breaking machine the flax is passed through a series of horizontal fluted rollers; the flutes do not touch, thus preserving the fibre while breaking the boon. In Austria and other European countries a more primitive, but, it is claimed, less injurious method of breaking is pursued, in which the fibre is opened with a 'bott-hammer' (batting-hammer), which is made of wood ridged like a cook's implement for pounding steak. In Continental countries scutching is almost invariably performed by hand, the flax being held in a groove made in an upright stand, and struck by a flat blade. Machine scutching is much more certain and expeditious than hand scutching, and is, in consequence, fast superseding it in Great Britain. After passing through the breaking-machine, the flax is subjected to the action of a series of knives attached to the arms of a vertical wheel; these knives strike the flax in the direction of its length. The process is gone through three times before the flax is ready for the market. Although machine scutching is expeditious, it is not capable of that pliant adaptation to the varying nature of the flax to be operated upon, which is obtained in hand scutching. The effect of machine scutching is to produce fineness by reducing and imparting rather than sustaining the character of the fibre—namely, the length and fineness of its 'staple' or fibre. In the chapter on "The Present Status of Flax Culture," in the *Year Book* of the United States Department of Agriculture for 1897, it is stated that a practical machine scutcher is a desideratum, "for the fact remains that notwithstanding the many inventions of such machines that have been brought to public notice,

. . . the Department of Agriculture cannot state authoritatively from experience that there is one that may be recommended as successful."

The initial processes of linen manufacture thus far described are usually performed by the farmer, although there is a tendency within recent years for the preliminary work of retting, bleaching, breaking, and scutching to be performed by companies, who buy the straw direct from the fields and prepare it for the linen factory. The next step that the flax undergoes is that of heckling, the object of which is to separate the longer and better portion of the fibre, called 'line,' from the shorter and raveled portion, called 'tow.' The hand heckle is a many-toothed steel comb, and the fineness of the flax increases with the number of times it is heckled, each time with a finer and finer instrument. Heckling is now usually performed by machinery. (See Heckles.) The fibre is then in readiness for spinning and for manufacture into linen, for which operations see Spinning and Linen Manufacture.

The world's production of flaxseed in 1898 was estimated at 75,914,000 bushels. Of this amount, America produced 26,833,500, Europe 31,241,500, India 17,839,000 bushels. The production of fibre was 1,762,566,000 pounds, all credited to Europe. Russia leads all countries in the production of both seed and fibre. Consult: Dodge, *Dictionary of the Fibre Plants of the World* (Washington, 1897); also "Fibre Investigations," in *United States Department of Agriculture Report No. 9* (Washington, 1897). See Fibre.

FLAX, New Zealand. A valuable fibre, quite different from common flax, obtained from the leaf of a lily-like plant, *Phormium tenax*, sometimes called flax-lily, and flax-bush. It is a perennial belonging to the order Liliaceæ, a native of New Zealand and Norfolk Island. Its leaves are from two to six feet long, and two to three inches broad; the flowers brownish yellow; the fruit a three-cornered capsule with numerous compressed jet-black seeds. The fibre of the leaves, which is both very fine and very strong, was used by the New Zealanders for making dresses, ropes, twine, mats, cloth, etc., before the discovery of New Zealand by Europeans. New Zealand flax thrives best on rich lowlands near rivers, and in such places is cultivated in its native country for making twine and ropes. It is also grown to some extent in California, and its cultivation has been attempted in parts of Europe; but the winters, except in the south, are too cold for it. To obtain the fibre the leaves are cut when they have attained their full size, and are usually macerated in water for a few days. But the New Zealanders procure the fibre in its greatest perfection—very long and slender, and shining like silk—by a more laborious process, without maceration. They remove the epidermis from the newly cut leaf, separating the fibres with their thumb-nails, and then more perfectly by combs. Large manufactories are now constructed, wherein the fibre is stripped by machinery. The best lands yield ten tons per acre of sun-dried leaves, which produce 1200 pounds of fibre, and 80 pounds of tow. See Fibre.

FLAX, False. See Gold of Pleasure.

FLAX'MAN, John (1755-1826). The leading sculptor of the English school. He was born at York, July 6, 1755. He was the son of John Flaxman, a modeler and maker of plaster casts. His health was delicate, and he had little early education. The most powerful and perhaps the earliest impulse which he received toward art appears to have been derived from the painter Romney, who fell in with him early in his career. His familiarity with the ancient poets begins at this time. Flaxman entered the school of the Royal Academy in 1770, the second year after its foundation. He exhibited in the same year, and won a silver medal. In the competition for the gold medal in 1772 he was not successful.

Flaxman's career as a sculptor begins with his engagement in the pottery of Josiah Wedgwood in 1775. England was at this time thoroughly impregnated with the love of antiquity, prevalent in the latter part of the eighteenth century. Wedgwood was one of the leaders in the movement toward the realization of antique conditions, and Flaxman was inspired with the same devotion.

Flaxman's work for Wedgwood was usually confined to small reliefs. As processes of manufacture improved, however, more ambitious performances were undertaken, for example, large bas-reliefs for chimney-pieces in 1776, a large tablet of "Apollo and the Muses" in 1777, etc. During this early part of his life Flaxman was intimately associated with William Blake. The influence of Flaxman's sense of outline and proportion often appears in the works of Blake; and the flavor of Blake's mysticism may be detected in the works of Flaxman.

In 1782 Flaxman established an independent studio in Wardour Street, London, and married Anna Denman. In 1787 he went to Rome, which was then under the influence of the school of archæologists and sculptors of which Winckelmann was the head, and Canova and Thorwaldsen the leading practical workers. The prevailing interest was classical, the art of the Renaissance being entirely neglected. Flaxman's first works in Rome were the superb series of outline illustrations to Homer's *Iliad* and *Odyssey*. The plates to Æschylus and Dante appeared later. These drawings, made under the need of bread-winning, have become the best known, and are certainly the most interesting and characteristic of Flaxman's productions. His chief works of sculpture in Rome were a statue of "Cephalus" and "Aurora," for Thomas Hope, and a restoration of the Belvedere "Torso of Hercules," which he conceived to be part of a group of two figures, "Hercules and Omphale." This piece was afterwards destroyed. While in Rome he made a large collection of plaster casts for the painter Romney. Flaxman returned to England in 1794. In 1797 he was elected associate, in 1800 a full member, and in 1810 professor of sculpture, at the Royal Academy. His lectures, ten in number, were published in 1829.

Flaxman died December 7, 1826, and is buried in the Church of Saint Giles-in-the-Fields, London. Casts of his chief works have been collected in a special museum in University College, London. The list of Flaxman's works is very large. The most important are the monument to Lord Mansfield, in Westminster Abbey (1796); monument to Sir William Jones, in the Church of Saint Mary's, Oxford (1797); several monumental works for the East India Company; and the monument to Captain Montague, in Westminster Abbey (1802). He projected but did not execute a colossal statue of "Britannia" 200 feet high, to be placed on Greenwich Hill (1800). He made the monument to the Baring family in Micheldean Church, Hampshire (1811); a model for a monument to Sir Joshua Reynolds in Westminster Abbey (1807); a monument to Lord Cornwallis for Prince of Wales Island (1812); a monument to Sir J. Moore for Glasgow (1813); a tripod executed by the goldsmiths Rundell and Bridge, and presented to John Kemble in 1817; "a realization of Homer's Shield of Achilles," which was made in silver gilt and bronze by the same artisans (1818); a pedimental group in marble for the Duke of Bedford's sculpture gallery at Woburn (1820); a group of "Maternal Love" for the monument to Mrs. Fitzharris (1817); the great group of "Saint Michael and Satan" (1821); "The Pastoral Apollo" (1824), etc. Consult: Cunningham, *Lives of the Most Eminent British Painters, Sculptors, and Architects* (London, 1830-33); Meteyard, *The Life of Josiah Wedgwood* (London, 1865-66); and Calvin, in Stephen, *Dictionary of National Biography*, vol. xix. (London, 1889).

FLEA (AS. *flēah*, Icel. *flō*, OHG. *flōh*, Ger. *Floh;* connected with OHG. *fliohan*, Ger. *fliehen*, to flee, AS. *flēon*, Icel. *flȳja*, Goth. *þliuhan*). One of the small wingless insects now commonly regarded as constituting a distinct order, Siphonaptera, containing a single family, Pulicidæ. All the species are very similar to the common European flea (*Pulex irritans*), which is plentiful in most parts of the world, and lives by sucking the blood of man and of certain quadrupeds and birds. It abounds particularly in the nests of poultry, pigeons, and swallows, and wherever dust accumulates in the chinks of floors, etc.; and it is to be found also plentifully in beds wherever cleanliness is neglected. The abundance of fleas in some hot, sandy countries is an intolerable nuisance to both travelers and residents. The female is rather larger and stronger than the male, but the sexes are otherwise very similar. The head is small, very compressed, rounded above, and has on each side a small round eye. The mouth has two lancet-like mandibles, the maxillæ being represented by two conical scales, the mandibles and the maxillæ forming a suctorial beak, with a slender, bristle-like tongue, the whole inclosed between two three-jointed plates. The thorax consists of three segments, the second and third of which bear a scale on each side, regarded as rudimentary wings. There is no marked division between the thorax and the abdomen, which consists of nine segments, much larger than those of the thorax, but much compressed. The whole body is covered with a tough integument. The activity of the flea, its power of leaping, and its extraordinary strength are well known. Its strength has been sometimes applied to the drawing of miniature carriages, cannon, etc. Fleas undergo a complete metamorphosis. The female lays about a dozen white eggs, slightly viscous. The larva is long and slender, at first white, afterwards reddish, and destitute of feet. It subsists upon animal particles in dust and upon the loosened particles of skin caught among an animal's hairs. When about to change into a pupa it incloses itself in a little silk cocoon, from which emerges the perfect flea. Cleanliness and careful attention are the principal means of keeping beds and houses free of fleas; but where these are found insufficient a free use of kerosene is recommended. The common flea of households in the United States is that of the cat and dog (*Pulex serraticeps*). The flea prevalent upon human beings in the Old World (*Pulex irritans*) is rarely seen in America. Squirrels, foxes, rats, and some other animals have separate species, of which in all about 100 are known, a third of which are American. Fleas have been accused of spreading disease, Grassi alleging that the cat-and-dog flea is an intermediate host for tapeworms; and certain others carry the bubonic plague. See CHIGOE.

FLEABANE. A common name applied in the United States to plants of the genus Erigeron (q.v.), and in England to those of Pulicaria, which belong to the order Compositæ. The whole plant emits a peculiar aromatic smell, which is said to be efficacious in driving away fleas and other insects. Two species are found in England, one of which, Pulicaria dysenterica, common in most places, has oblong leaves, a cottony stem twelve to fifteen inches high, and panicled flowers. It has been used in diarrhœa and dysentery. The name fleabane is applied to a species of an allied genus, Conyza squarrosa. The Persian insect-powder, or buhach, as it is sometimes called, is prepared by pulverizing the flower-heads of related plants, Chrysanthemum cinerariæfolium and Chrysanthemum roseum. The former species, extensively grown in California, yields more than double the amount of insect-powder produced by the second species.

FLEA-BEETLE. Any of many of the smaller leaf-beetles of the family Chrysomelidæ, so called on account of their activity in jumping, and characterized by the great thickening and muscularity of the hind femora. They were formerly grouped under the name Haltica, but are now divided into the genera Psylliodes, Dibolia, Phyllotreta, Galeruca, Diabrotica, and their allies. Many of them do vast damage to shade-trees and farm crops. See LEAF-BEETLE, and the accounts of insects affecting the MELON, GRAPE, TURNIP, etc.

FLEA-LOUSE. A plant-louse of the family Psyllidæ, having "two-jointed tarsi, antennæ eight or nine-jointed, and the hind legs with somewhat swollen thighs," enabling them to leap vigorously, as other plant-lice do not. Many forms make galls, others secrete honeydew; and they live upon certain trees, which they damage seriously. One species (*Psylla pyricola*) is a pest of pear-trees in the northwestern United States. Consult: Riley, "Notes on American Psyllidæ," in *Proceedings of Biological Society of Washington*, vol. ii. (Washington, 1884). See PEAR-INSECTS.

FLEANCE, flē′*a*ns. The son of Banquo, in Shakespeare's *Macbeth*. Macbeth instigates an attempt against his life in fear that the witches' prophecy will be fulfilled, and that he will come to the throne of Scotland.

FLÈCHE, flĕsh, LA. The capital of an arrondissement in the Department of Sarthe, France, situated on the right bank of the Loire, twenty-four miles south-southwest of Le Mans (Map: France, G 4). It is a well-built town, and is celebrated for the Prytanné military school, with a library of 20,000 volumes, situated in an old

Jesuit college built by Henry IV. It is a preparatory school for Saint-Cyr. Among its famous alumni have been Prince Eugène, Descartes, and Picard, the astronomer. La Flèche has some trade in corn, hay, and wine, also manufactures of oil, leather, and gloves. Population, in 1901, 10,519.

FLÉCHIER, flå'shyå', VALENTIN ESPRIT (1632-1710). A French ecclesiastic. He was born at Pernes, near Avignon, and educated in the College of the Congregation of Christian Doctrine at Tarascon. In 1659 he went to Paris and taught for a time, but soon gave himself entirely to preaching. He won great fame as an orator, and particularly by his funeral orations, among which that on Marshal Turenne (1676) is considered his masterpiece. That on Madame Montausier secured his admission to the Academy at the same time with Racine (1673). He also wrote poems in French and Latin, and political compositions, among which were the *Carmen Eucharisticum* (1660), celebrating the Peace of the Pyrenees; *Circus Regius* (1662), describing a tournament given by Louis XIV.; and *Mémoires sur les grands jours de Clermont* (first published in 1844), in which he relates in half romantic and half historic form the proceedings of that extraordinary court of justice. In 1685 he was appointed Bishop of Lavaux, and in 1687 of Nîmes. The Edict of Nantes had been revoked two years earlier, and Calvinists were still numerous in the bishopric. In the troublous times which followed he softened, to the utmost of his power, the rigor of the edicts, and showed himself so sensible to the evils of persecution and so indulgent even of what he regarded as error, that his memory was long held in veneration by the Protestants of the district. In the famine which followed the winter of 1709 he assisted all in his diocese without regard to their religious tenets, declaring that all alike were his children. His works appeared at Nîmes in ten volumes (1782), and at Paris (2 vols., 1856). His funeral orations have been often printed; that on Marshal Turenne may be found in English in Fish, *History and Repository of Pulpit Eloquence* (New York, 1856), and in Lee, *The World's Orators*, vol. iv. (New York, 1900). For his life, consult Delacroix (Paris, 1883).

FLECHSIG, flĕᴋ'zĭᴋ, PAUL EMIL (1847—). A German physician. He was born at Zwickau, and was educated at the University of Leipzig, where he was appointed professor of psychiatry in 1884. His close personal investigations of the various European systems for the treatment of insanity secured for him an appointment in 1882 as director of the Clinical Institute of Psychiatry and Neurology at Leipzig, on the organization and management of which he subsequently published the work entitled *Die Irrenklinik der Universität Leipzig in den Jahren 1882-86* (1887). His original investigations on the structure of the brain are embodied in the work entitled *Die Leitungsbahnen im Gehirn und Rückenmark des Menschen auf Grund entwicklungsgeschichtlicher Untersuchungen dargestellt* (1876).

FLECK, EDUARD (1804-79). A Prussian writer on military law, born at Pförten, Lower Lusatia. After serving as auditor of the garrison at Magdeburg, he was appointed general auditor of the Prussian Army in 1857. In 1876 he was invested with the rank of lieutenant-general. He was long an instructor in the Military Academy at Berlin, and during a period of more than thirty years assisted in the formation of nearly every important military law enacted in Prussia. His works, which relate chiefly to military jurisprudence, comprise the following: *Erläuterungen zu den älteren preussischen Kriegsartikeln* (latest ed. 1850); *Die Verordnungen über die Ehrengerichte im preussischen Heer* (3d ed. 1865), *Kommentar über das Strafgesetzbuch für das preussische Heer* (latest ed. 2 vols., 1869); *Militärstrafgesetzbuch für das Deutsche Reich* (2d ed. 1880).

FLECK, JOHANN FRIEDRICH FERDINAND (1757-1801). A noted German actor of the National Theatre at Berlin. He was born at Breslau, and in youth studied theology, for a time attending the University of Halle. Having joined a theatrical troupe, however, at Leipzig in 1777, he went, two years later, to Hamburg, where he became very successful. He made his appearance at Berlin in 1783. Among his celebrated characters were Karl Moor, Götz, Lear, Shylock, and Wallenstein.

FLECKEISEN, flĕk'ī-zen, ALFRED (1820-99). A German philologist, born in Wolfenbüttel (Brunswick). He studied at the University of Göttingen, and was connected with educational institutions at Frankfort-on-the-Main and at Dresden, where from 1861 until his retirement in 1889, he was associate principal of the Vitzthum Gymnasium. From 1855 he was editor of the department of classical philology in Jahn's *Jahrbücher für Philologie und Pädagogik*. His publications include *Kritische Miscellen* (1864), a recension of Halm's text edition of the *Vitæ* of Nepos (last impression 1898), and a standard critical edition of Terence (1857; revised and enlarged 1898). The last two of these appeared in the well-known *Bibliotheca Teubneriana*.

FLECKNOE, flĕk'nō, RICHARD (?-c.1678). An English versifier of the seventeenth century, about whom very little is known. It is said that he was an Irishman and a Roman Catholic priest, and according to his own account, he traveled much in Europe and America—*Ten Years' Travels* (1656). His voluminous writings, consisting of plays, epigrams, and miscellaneous poems, are no longer read even by scholars; and in his own time he was the type of a dull and tiresome versifier. As such, he was immortalized in Dryden's *Mac Flecknoe* (1682).

FLEECE'EM, Mrs. A character in Foote's *The Cozeners*, intended as an exposure of Mrs. Grieve, who had victimized Charles Fox.

FLEE FROM THE PRESS. A poem ascribed to Chaucer, before 1532, but attributed by many later critics to John Lydale. It is sometimes known as the *Balade of Goode Counseil*.

FLEET, THE. A small creek, anciently called Fleta, rising near Hampstead Hills, and passing near the west wall of London City. Its lower portion was navigable at the time of Edward I., but it is now arched over and converted into one of the large city sewers, discharging into the Thames at Blackfriars Bridge. Its pestilential condition when the water was diverted is described by Jonson, Pope, Swift, Gay, and other writers.

FLEET MARRIAGES. Irregular and clandestine marriages, celebrated in the Fleet Prison and vicinity toward the end of the seventeenth and during the eighteenth century. The Fleet Prison naturally had its chapel where regular marriages could be contracted; and there is no reason for believing that the earliest recorded marriages in the Fleet (1613-74) were in any way irregular. But in the latter half of the seventeenth century clandestine marriages became very common in England, owing to the great expense of the public ceremony. In many of the churches marriages were performed without license or banns. By an act of 1696 (17 and 18 Wm. III., c. 35 secs. 2-3) a penalty of £100 was imposed upon any clergyman who married or permitted another to marry couples otherwise than by banns or license. This act partially checked clandestine marriages in the Fleet Chapel, but it had no restraining influence upon the debtor clergymen of the prison, for whom the penalty of a fine could have no terrors. Accordingly it came to be common for those who desired to be married in secret to resort to the Fleet. Irregular clergymen and even laymen gathered in the vicinity to share in the business of performing marriage ceremonies. They opened offices in ale-houses and barber-shops, and employed 'pliers' or 'touts' to secure the custom of those desiring their services. A scandalous competition arose in which these clergymen strove to outdo one another in laxity, in order to increase their business. Registers of marriages were kept and manipulated to suit the desire of the contracting parties. Youths were enticed into marriage with persons of low degree; bigamous marriages were connived at by the clergyman who thus gained an additional fee. The abuses of the system, in short, would be beyond credence were they not attested by a vast amount of evidence.

These marriages were not illegal, since before the Act 26 Geo. II., c. 33, there was no necessity in England for any religious ceremonial in the performance of a marriage, which might be contracted by mere verbal consent. But those who had contracted a Fleet marriage had no evidence of the fact. The Fleet parsons kept registers, indeed, but they were so notoriously falsified that they were not received as evidence in courts of law (Doe I. Davies *vs.* Gatacre, 8 Carr and P., 578). Thus innocent parties were frequently involved in the greatest hardships. Finally, conditions became so intolerable that it was necessary to sweep away the whole system. The 25 Geo. II., c. 33, declared void all marriages in England that should be solemnized otherwise than in a church or public chapel where banns had been published, unless under a special license. The Fleet marriage disappeared when this act went into force. Consult: Burn, *History of Fleet Marriages;* Ashton, *The Fleet* (London, 1889).

FLEET PRISON. A celebrated London jail, which stood on the east side of Farringdon Street, on what was formerly called Fleet Market. The keeper of it was called the Warden of the Fleet. It derived its name from the Fleet rivulet (so named from its rapidity), which flowed into the Thames. In 1842 the separate jurisdiction anciently vested in the wardens of the Fleet and the Marshalsea was abolished, and their functions transferred to the Court of Queen's Bench, the Fleet being thenceforth known as the Queen's prison. The Fleet was the royal prison as far back as the twelfth century. The followers of Wat Tyler burned it in the reign of Richard II. In the sixteenth and seventeenth centuries it acquired a high historical interest from its having been the prison of the religious martyrs of the reigns of Mary and Elizabeth, and of the political victims of the courts of the Star Chamber and High Commission in that of Charles I. On the abolition of the Star Chamber, in 1641, the Fleet became a place of confinement for debtors and persons committed for contempt by the courts of Chancery, Exchequer, and Common Pleas. During the eighteenth century it was the scene of every kind of atrocity and brutality, from the extortion of the keepers and the custom of permitting the warden to underlet it. The Fleet was several times rebuilt; the last building was erected after the burning of the older one in the Gordon riots of 1780, the predecessor of which had been destroyed in the great fire of London in 1666. Latterly it usually contained 250 prisoners, and kept ward of about 60 outdoor *détenus* for debt privileged to live within the rules. See Debtor.

FLEET STREET. An old street of London, which takes its name from the Fleet stream; formerly a favorite place for shows and now noted for its banking, newspaper, and printing offices.

FLEET′WOOD, or **FLEETWOOD-ON-WYRE.** A seaport and military station in Lancashire, England, on the estuary of the Wyre, about twenty miles southwest of Lancaster (Map: England, C 4). It was founded in 1836, and is a favorite resort for sea-bathing. It has a fine harbor with extensive docks and an important shipping trade. Population, in 1891, 9000; in 1801, 12,100.

FLEETWOOD, Charles (?-1692). An English Parliamentary soldier. He was studying at Gray's Inn at the outbreak of hostilities between Charles I. and the Parliamentary forces, and joined the latter, enrolling in 1642 as a private trooper in the life-guard of the Earl of Essex, but was promoted rapidly and was colonel of a regiment of horse at Naseby. In 1646 he entered the House of Commons, and took a prominent part in the quarrel between Parliament and the army in 1647, being one of the officers appointed by the army to treat with the Parliamentary commissioners. He took no part in the King's trial, but accompanied Cromwell to Scotland in 1650, participated in the battle of Dunbar, and as a lieutenant-general commanded the cavalry at the defeat of Charles II. at Worcester, in 1651. In 1652 he married Cromwell's daughter, Bridget, the widow of Ireton, and was made commander-in-chief of the Parliamentary forces in Ireland, which position he retained until 1655, the last year with the rank of Lord Deputy. He ardently supported the proclamation of the Protectorate. His rule in Ireland was not a success, and Cromwell recalled him in 1655, although he continued to hold the title of Lord Deputy until succeeded by Henry Cromwell in 1657. In 1655 Fleetwood was one of the major-generals appointed to look after the interior administration of the realm. He opposed the proposal to make Cromwell King, was a member of the newly constituted House of Lords, and supported the Protector in all his later quarrels with Parliament. After Cromwell's death he was accused of attempting to succeed him as Lord Protector, and although he gave his support to Richard Cromwell, he was constantly the centre of the army intrigues to supplant him. He was commissioned commander-in-chief of the army in 1659. He took no part in the restoration of Charles II., but did not oppose it, and as a result was included in the Act of Indemnity, being merely incapacitated from holding office. He lived for 32 years after the Restoration, but did not again take part in public affairs.

FLEETWOOD, George (?-c.1665). An English Parliamentary leader, born in Buckingham. He represented his native shire in the Long Parliament (1647), and in 1649 he signed the death warrant of Charles I. He had raised dragoons in the service of Parliament, and Cromwell made him first a knight, then a lord. At the Restoration he was condemned to death as a regicide, but upon forswearing his former allegiance and furnishing proofs of repentance he was merely deprived of his estates. He spent the remainder of his life in America.

FLEETWOOD, George (1605-67). A general in the Swedish service, born at Cope, Bedfordshire, England. In 1630 he joined Gustavus Adolphus in Germany, and raised an infantry regiment for him in England. He was knighted in 1632, and was made a baron by Queen Christina in 1654. Two years later he was made lieutenant-general, and in 1665 a member of the Swedish Council of War. He married in Sweden (1640), and had two daughters and four sons. One of the latter became a soldier in the guard of Charles II.

FLEETWOOD, John. The name—probably a pseudonym—given as that of the author of *The Life of Jesus Christ and the Apostles,* first published in London in 1767, and many times reprinted. The work had an immense circulation, and for nearly one hundred years was the only life of Jesus read in religious families in English-speaking countries. It is now unreadable. *The Christian Prayer Book* and a *Christian Dictionary* are also attributed to the same author.

FLEETWOOD, William (1656-1723). An English clergyman and author, born in the Tower of London, and educated at Eton and Cambridge. He took holy orders and became a noted preacher of his time. He was appointed royal chaplain to William and Mary, and was canon at Windsor under Queen Anne, who afterwards made him Bishop of Saint Asaph (1708). Nine years before his death he was elected Bishop of Ely, and he was buried in that cathedral. A number of his sermons were published, and his nephew collected these into a single volume (1737).

FLEGEL, flā′gel, Robert (1855-86). A German traveler, born at Vilna, Russia. In 1875 he became connected with the factory at Lagos, Guinea, West Africa, in 1879 ascended and surveyed the Benue, and from that time on was unceasing in his efforts to open that river and the adjacent region to German trade. In 1882 he discovered the source of the Benue near Ngaumdere, Kamerun. He visited Europe in 1884, obtained the support of the German African Society and of the Colonial Union, and was commissioned by the Emperor to present gifts to the Sultan of the powerful native State of Sokoto. When he returned, however, with the object of establishing trading posts in the district between the Niger and the Benue, he found that the territory had already been occupied by the English Niger Company. He was recalled to Europe in 1886, but died on the coast. He wrote *Lose Blätter aus dem Tagebuch meiner Haussa-Freunde* (1885), and *Vom Niger-Benue, Briefe aus Afrika* (1890). Consult also *Mitteilungen der afrikanischen Gesellschaft in Deutschland,* vols iv. and v. (Berlin, 1883-89).

FLÉGIER, flȧ′zhyȧ′, Ange (1846—). A French composer, born in Marseilles. He entered the Paris Conservatory, and there studied under Bazin and Ambroise Thomas. In 1875 his one-act comic opera *Fatma* was performed in Marseilles. A most versatile composer, his various works include: *Ossian,* a symbolic poem; *Ronde nocturne,* for orchestra; *Scènes antiques,* a suite for orchestra; *La nuit,* for full choir and orchestra; and numerous marches, instrumental pieces, overtures, etc.

FLEISCHER, flīsh′ẽr, Heinrich Leberecht (1801-88). A distinguished German Orientalist, born at Schandau in Saxony. He studied theology and Oriental languages in Leipzig and later in Paris, under De Sacy and Caussin de Perceval, from 1824 to 1828. He began his career as teacher at a gymnasium in Dresden, to which post he was appointed in 1831, and while there catalogued the manuscripts in the Oriental department of the Saxon Royal Library. In 1835 he was appointed to a professorship of Oriental languages in the University of Leipzig, which he retained until his death, in 1888. Fleischer became the teacher of almost all the Oriental scholars in Germany during two generations, and his career marks an epoch in Oriental studies. He is principally known as an Arabist. His most important publications are: (1) Abulfeda, *Historia Ante-Islamica,* with notes and a Latin translation (1831); (2) an edition of *Ali's Hundred Sayings* (1837); and (3) an edition of Beidhawi's *Commentary on the Koran* (1844-48); and three volumes of *Beiträge zur arabischen Sprachkunde* (1863-84). In addition to this, he assisted in editing a large number of texts published by the various scholars, made many contributions to Levy's Aramaic and Talmudical dictionaries, and in numerous other ways left an impress on Oriental studies in the nineteenth century. He was one of the founders of the German Oriental Society, and a constant contributor to it and to the Royal Saxon Academy.

FLEISCHER, Moritz Anton Hermann (1843—). A German agricultural chemist, born at Cleve, Prussia. He studied in Berlin, and after several years of service as assistant in various agricultural institutions, he was made director of the Agricultural Experiment Station of Bonn in 1875, and that of Bremen in 1877. In 1891 he was appointed professor of chemistry at the Agricultural Institute of Berlin, and remained connected with the Agricultural Experiment Station of Bremen in the capacity of curator. His published works include: *Die Thätigkeit der Central-Moorkommission* (1882); *Die Torfstreu, ihre Herstellung und Verwendung* (1890). He also wrote important parts of the *Landwirtschaftliche Jahrbücher,* and of the *Protokolle der Sitzungen der Central-Moorkommission.* For ten years he was the editor of *Biedermanns Centralblatt für Agrikulturchemie.*

FLÉMAL, flå′mål′, or **FLEMAEL**, Bertholet (1614-75). A Flemish painter, born at Liège. He studied under Girard Douffet and then went to Rome and Florence, where he lived for several years. Upon his return he stopped in Paris, and executed his most important work, a decorative painting for a church, now destroyed, near the Luxembourg (1644). His second visit to Paris was of longer duration. He became a member of the Royal Academy (1670), and painted the ceiling of the King's Chamber in the Tuileries. He was also the architect for several churches at Liège. His pictures are rare; the most noted is "Le Christ au tombeau," in the Berlin Museum. It is well composed, but weak in color. His work shows the influence of Poussin.

FLEMING, Abraham (c.1552-1607). An English poet and antiquary, born in London. He was educated at Cambridge, was chaplain to the Countess of Nottingham and afterwards rector of Saint Pancras, Soper Lane, London. Besides being an enthusiastic collector of old manuscripts he was an excellent translator of Latin and Greek into English verse, to which he frequently added original matter; and he also assisted in the production of Holinshed's Chronicles.

FLEMING, John, Lord (c.1537-72). A Scottish lord, partisan of Mary Stuart. He succeeded to the title after the death of his brother James (1558); became Great Chamberlain in 1565 and Governor of Dumbarton Castle in 1567. He was with Mary at Langside and escorted her to Carlisle. The Queen wished to send him to France, but Elizabeth would not permit this. Fleming withdrew to Scotland and held Dumbarton in Mary's name, in the hope of making an entrance possible for French troops; but the castle was taken in 1571. Fleming escaped, however, and went to France. He was shipwrecked on his return with French soldiers to take up Mary's cause, but escaped with the loss of his papers and returned to Edinburgh. Here he was accidentally shot (1572) when the French entered the city. His son, John Fleming, was first Earl of Wigton; he died in 1619 and was succeeded by another John, who died in 1650.

FLEMING, John (1785-1857). A Scottish naturalist and preacher. He was licensed as a minister, and preached in Fifeshire. He devoted most of his time, however, to the study of the natural sciences. In 1834 he was appointed professor of physics at Aberdeen. Afterwards he filled the chair of natural history at Edinburgh. As a naturalist he is best known as the originator of the so-called dichotomous or binary system of classification, which he endeavored to establish in spite of strong opposition on the part of Cuvier and others. He published a number of interesting works, including: *Economic Mineralogy of the Zetland and Orkney Islands* (1807); *Philosophy of Zoölogy* (1822); and a *History of British Animals* (1828).

FLEMING, John Ambrose (1849—). An English physicist and electrical engineer. He was born at Lancaster, November 29, 1849, and received his education in the University College School and University College, London. He was appointed professor of mathematics and physics at the University College, Nottingham, but resigned in 1881 to become electrical engineer to the Edison Electric Lighting Company. In 1882 he was elected a member of the Institution of Electrical Engineers, of whose council he has been for many years a member, and was chosen a fellow of Saint John's College, Cambridge, and a fellow of the University College, London. While not giving up consulting and expert work entirely, Professor Fleming in 1885 accepted an appointment as professor of electrical engineering in University College, where a fine laboratory was erected under his direction, and a complete course in electrical engineering given. He was also largely interested in founding the National Physical Laboratory and has done active work in promoting popular education in science. He has delivered many popular lectures and has read many papers before scientific societies. He has published: *Short Lectures to Electric Artisans* (1885); *Treatise on the Alternate Current Transformer* (1889-92); *Electric Lamps and Electric Lighting* (1894); *Electric Laboratory Notes and Forms* (1894); and *Magnets and Electric Currents* (1897). His work on the transformer is considered a standard and of great value by electrical engineers.

FLEMING, Klas Erikson (c.1530-97). A Swedish admiral and statesman. He was born in Finland, son of Erik Fleming, and belonged to a family originally from Flanders. In 1561 he was appointed Governor of Esthonia by Erik XIV. He fought against Duke John (1563), but later went over to him and was made a peer and counselor on John's accession to the throne (1568). In the next year he commanded the army which repelled the Danes. Because of his personal valor and his high place in the kingdom, as well as because of his relation to Gustavus Vasa, whose sister-in-law, Ebba Stenbock, he had married (1573), he exerted great influence. In 1588 he was made grand admiral, and in 1591 commanded in the war with Russia and was practically regent of Finland. On the death of John III. (1592), Fleming upheld the claim of Sigismund against Duke Charles, and at the end of the war with Russia refused to dismiss his soldiers and went with his fleet to Danzig to fetch Sigismund to Stockholm. After Sigismund's coronation (1594) Fleming was made Governor of Finland. He put down a fierce peasant insurrection, and was preparing to attack Duke Charles, when he died.

FLEMING, Lady Mary. The principal attendant on Mary, Queen of Scots, during the latter's imprisonment at Lochleven Castle, in Scott's *Abbot.*

FLEMING, or **FLEMMING**, Paul (1609-40). A German poet. He was born at Hartenstein (Saxony), studied at the universities of Leipzig and Leyden, and in 1633-39 accompanied the embassy sent by Duke Frederick of Schleswig-Holstein to Moscow and Persia. His early work was in the manner of Martin Opitz (q.v.), whom he afterwards greatly surpassed. He is not indeed wholly free from the volubility and artificiality characteristic of the verse of his time, but he displays more frequently than do his contemporaries sincerity and directness, and easily outranks them all as to poetical structure. His collected poems, edited by his friend Adam Olearius, were published in 1646. The best subsequent edition is by Lappenberg (the Latin poems, 1863; the German, 2 vols., 1865) in

Numbers 73, 82, and 83 of the *Bibliothek des litterarischen Vereins.* Consult also: Varnhagen von Ense, *Biographische Denkmale,* vol iv. (3d ed., Leipzig, 1872); Straumer, *Flemings Leben und orientalische Reise* (Leipzig, 1892); and Wysocki, *De Pauli Flemingi Germanice Scriptis et Ingenio* (Paris, 1892).

FLEMING, Paul. The chief character in Longfellow's *Hyperion.*

FLEMING, Richard (c.1360-1431). A bishop of Lincoln, born in Yorkshire, and educated at Oxford. There he came under the influence of Wiclif's teachings; declared for them as member of the commission of twelve appointed to see if they were heretical; and was very severely reprimanded by Archbishop Arundel in the matter. But later, and especially as Bishop of Lincoln (1420), he showed himself a zealous upholder of Papal authority; was president of the English nation at the Council of Pavia (1423), and championed the power of the Pope above that of the Council. On his return to England he was appointed by the Pope Archbishop of York (1424), but, as the King had already granted that office to the Bishop of Worcester, duly elected by the chapter, Fleming had to give up his claim. In 1427 he began to plan a new college at Oxford, especially to hinder the spread of heresy and error; but Lincoln College was not founded till after his death. He is best known in episodic history as the Bishop of Lincoln, who exhumed Wiclif's body, burned it, and threw it into the Swift. He is mentioned by Bale as author of *Super Angliæ Etymologia,* but this is lost if it ever existed.

FLEMING, Rose. A kind-hearted girl in Dickens's *Oliver Twist.* She was adopted by Mrs. Maylie and married the latter's son Harry. She accompanied Mr. Brownlow to hear the confession which cost Nancy Sikes her life.

FLEMING, Sir Sandford (1827—). A Canadian surveyor. He was born in Kirkcaldy, Scotland, and came to Canada at the age of eighteen. After having been associated with the Northern Railway for about twelve years, he was appointed chief engineer of that road. He was also chief engineer of the Intercolonial Railroad, and in 1871-72 made the first survey for the Canadian Pacific Railway, with the planning and construction of which he remained associated until 1880. The construction of the present railroad across Newfoundland was also due to his initiative. He was the founder of the Canadian Institute and elected president of the Royal Society of Canada in 1888, and chancellor of Queen's University in 1880. The establishment of a prime meridian to be universally adopted for time-computation, and the laying of a cable across the Pacific, are among the numerous schemes with which he became prominently identified and which are discussed in several of his principal works, among which are: *Uniform Standard Time* (1881); *A Cable Across the Pacific* (1882); *The Prime Meridian Question* (1884); *Expeditions to the Pacific* (1889).

FLEM'INGS. See Flanders.

FLEM'INGSBURG. A town and the county-seat of Fleming County, Ky., 68 miles southeast of Cincinnati, Ohio; on a spur railroad connecting with the Louisville and Nashville (Map: Kentucky, H 2). It is in an agricultural region, and has a trade in tobacco and manufactures of tobacco, flour, lumber, etc. Population, in 1890, 1172; in 1900, 1268.

FLEM'INGTON. A village and the county-seat of Hunterdon County, N. J., 50 miles west by south of New York City; on the Pennsylvania, the Lehigh Valley, and the Central of New Jersey railroads (Map: New Jersey, C 2). It is the commercial centre for a productive agricultural region, and has manufactures of foundry products, stoneware, flour, brick, etc. Population, in 1890, 1977; in 1900, 2145.

FLEMISH LANGUAGE AND LITERATURE (Flem. *Vlaemsch,* Dutch *Vlaamsch,* OFris. *Flemsche, Flaemsche;* connected with Flem. *Vlaenderen,* Dutch *Vlaanderen,* Ger. *Flandern,* Flanders). The Low German language and literature of Belgium. The earliest history of the Flemish language is also the history of Dutch, the name specifically applied to the language of the Netherlands. The oldest stage of both is the dialect group called Old Low Franconian, spoken, from the seventh century to the middle of the twelfth by various German peoples in the whole Lower Rhine region, from the confluence of the Ruhr with the Rhine to the sea. When out of the popular dialects, in the second half of the twelfth and the beginning of the thirteenth century, a written language was developed, a number of dialect groups existed in what are now the Netherlands and Belgium that had an important bearing upon the subsequent formation of the language. Frisian (q.v.), at the beginning the principal dialect, was spoken in the territory farthest north and along the seacoast; Saxon, in the region about the Yssel; Franconian, on the Rhine. Out of Frisian and Saxon contact had arisen a Frisian-Saxon mixed dialect, which was spoken principally in territory subsequently Dutch, but also in a small part of West Flanders. Out of Frisian contact with Franconian, furthermore, had arisen a Frisian-Franconian mixed dialect. The territory of the latter, besides those parts subsequently Dutch, was East Flanders, west of the Scheldt and the Lys, and the greater part of West Flanders. Pure Franconian was spoken in territory subsequently Dutch, but also in East Flanders, east of the Lys and the Scheldt, in Antwerp, in South Brabant, and in Limburg. Each of the main dialects, in this way, contributed its quota to what was, in the end, to be the language of the Low German part of Belgium.

The first dialect which, as far as can be ascertained, developed a written language, was the Franconian of Limburg, in which Henrik van Veldeke, born in the neighborhood of Maastricht, wrote after the middle of the twelfth century. The oldest poems of the thirteenth century were written in Limburg, Brabant, Antwerp, and particularly in Flanders. They all exhibit local dialectic peculiarities, but there is visible in them, at the same time, the tendency toward a common literary form. The Flemish poet Jacob van Maerlant (c.1235-1300), the founder of the didactic school of poetry in the Netherlands, and sometimes called 'the father of Dutch poets,' in his *Leven van St. Franciscus,* names as dialects 'Duutsch,' by which he apparently means the dialect of Holland, Brabantish, Flemish, and Zealandish. His own work shows the striving, already indicated, to write a literary form, which tendency obviously continued during the succeeding centuries, down to the close of the middle period in the history of the language, at the end of the fifteenth century.

During the sovereignty of the Dukes of Burgundy, which terminated in 1477, the language was subjected to French influence, which resulted not only in the introduction of a multitude of French words, but also in the loss of inflexional endings, and made the sixteenth century a period of linguistic confusion. The writers on language, of whom there were many at this time, endeavored each to make his own dialect the recognized literary form, and the dialect of Bruges, the East Flemish of Ghent, and the dialect of Brabant were in turn presented as forms of usage. Toward the end of the century, however, this had given way to the feeling that the common language should have more general characteristics and should represent the whole rather than any particular part. Pontus de Heuiter, who published, in 1581, at Antwerp, his *Nederduitse Orthographie*, said of his own language that it is "set together out of the speech of Brabant, Flanders, Holland, Guelders, and Cleves," and this was ultimately the common attitude.

The possibility of the development of a common literary language for the Netherlands and Belgium, which at this time, on account of the superior literary culture of Brabant and Flanders, bade fair to have a southern character, was definitely determined in the negative by the political events at the close of the sixteenth century. The northern provinces, in 1581, formally threw off their allegiance to the Spanish Crown, and, as the Dutch Republic, declared themselves an independent State. The centre of literary culture was presently shifted from the south to the north, and out of the dialect of the Province of Holland was developed the literary language of the Netherlands, called specifically Dutch.

The southern provinces were destined to a wholly different fate. After the taking of Antwerp, in 1585, by the Duke of Parma, the Belgian Netherlands (including Limburg, South Brabant, Antwerp, East Flanders and West Flanders, etc.) were separated from the northern provinces. They remained under Spanish supremacy until, in 1714, by the Peace of Rastadt, they were awarded to Austria. In 1794 they were conquered and annexed to France. During this whole period of foreign domination literature had sunk almost to its lowest possible ebb. The literary language, which at one time had made its influence felt over the whole of the Low Countries, remained fixed in its sixteenth-century form, and was on the point of degenerating again into a mere dialect of the people. Its place as the language of the cultured classes, and particularly after the French occupation in 1794, had been taken more and more by French, already the sole language of the other Belgian provinces, Liège, Luxemburg, Namur, and Hainaut. The union of Belgium with Holland into the Kingdom of the Netherlands, in 1815, did not change existing conditions. Although the new sovereign, William of Orange, did his utmost to further the use of Low German in the place of French, his efforts were opposed both by the people, who, from the standpoint of their own dialect, regarded the language as a foreign tongue, and by the cultured classes, who would not thus differentiate themselves from the French-speaking provinces of the south. The Revolution of 1830, which finally separated Belgium from Holland and in the end made it an independent European State, apparently settled for all time the fate of the Low German language. French became the single official medium; a literary language no longer existed in the Low German provinces, and the spoken dialects, with considerable local differences, alone held possession of the field.

A movement, known as the 'Flemish Movement,' whose purpose was to rehabilitate Low German as the literary and official language, was, however, presently begun and has ultimately been successfully carried through. Jan Frans Willems, who in the time of the United Kingdom had attempted without result to further the use of the native tongue, now set out in the light of the awakening of the new spirit of nationality, after 1839, to accomplish this end. Under the influence of this movement, poets like Karel Ledeganc, Theodor van Rijswijck and Prudens van Duyse, and prose writers like Hendrik Conscience wrote Flemish, and an active propaganda was made to bring the language back again into the place in which it once stood in the estimation of all classes of the community. The Belgian Government, by the three language laws of 1873, 1878, and 1886, gave to the movement the official sanction which was needed to complete it. By these enactments Flemish is made, with French, the legal and official language of the kingdom, the knowledge of which is required, and it is placed among the subjects of public instruction in the schools. The foundation of the Royal Flemish Academy (*Koninklijke Vlaamsche Akademie*), in 1886, was the final consummation of the movement.

The territory of the Flemish language at the present time is, generally speaking, the Belgian provinces of Antwerp, Limburg, Brabant, East Flanders, and West Flanders, the boundary between French and Flemish being approximately a straight line drawn from Liège southward of Brussels to Calais, although French is spoken in some places to the north and Flemish to the south of such a line. The Flemish language does not differ materially from Dutch, with which in the earliest period, as we have seen, it was coincident. The three centuries during which there was little or no connection between the northern and the southern Netherlands, and in which each went its own way, brought about differences, however, that, in spite of the unity that has been adopted in the orthography of Dutch and Flemish, still make the one readily distinguishable from the other. In addition to peculiarities of syntax, of idiom, and of the specific choice and meaning of words, Flemish is particularly characterized by the relatively large number of French elements in its vocabulary.

FLEMISH LITERATURE. It is only with the Flemish movement, already mentioned, that the history of Flemish literature, in the strict sense of the word, begins. Before the nineteenth century the literature of Flanders was indistinguishable from Dutch. (See DUTCH LANGUAGE AND LITERATURE.) The first real step toward a recognition of Flemish was made by the Academy of Brussels in 1772, which put this language on an equal basis with French and Latin. The movement was checked by the French occupation in 1794, and, as noted above, it was not until Jan Frans Willems appeared that Flemish became a literary language. As early as 1818 Willems set forth his views concerning the value of Flemish and its ancient history in his dissertation, *Sur la langue et la littérature néerlandaises, par rapport aux provinces méridionales des Pays-Bas.* The movement was actively supported by the Government until 1830, when it received a temporary setback. Soon, however, the Government returned to its policy of encouragement, and in 1836 commissioned Willems to publish the Middle-Flemish poem of *Reinaert*, which he had discovered. This was followed by other texts in rapid succession. At the same time a Flemish annual, *Nederduitsch letterkundig jaarboekje*, was being published by Rens, and was in a flourishing condition. Other pioneers with Willems were David, the founder of the review *De Middalaer*, Serrure, Snellaert, Blommaert, and Bormans, of whom the last four collaborated in the *Belgsch Museum*, which was edited by Willems. One of the most important of the early Flemish writers was Charles-Louis Ledeganck, whose poetry marks an epoch in the history of the literature, in such contributions as his *Bloemen mijner lente*, and *De Hut in 't Wowd.* He became later also a prose-writer in his *De Zinnelooze* and *Vaarwel tot de jeugd;* but his masterpiece is the poem *De drie Zustersteden*, in praise of Ghent, Bruges, and Anvers, the three capitals of Flanders. The Middle Flemish literature, whose study had been begun by Willems, was continued ably by Serrure in his *Vaderlandsch Museum* (1855-61), and by David, Bormans, and Snellaert. The most important of the early novelists was Hendrick Conscience, whose masterpiece was his *Artevelde*, published in 1850, but who was a most prolific author, writing no less than seventy-one books. Theodor van Rijswijck returned to poetry, publishing *Oorspronkelijke Verhalen* and *Eppenstein*, and his masterpiece describing the Flemish aspirations, *Antigonus.* Contemporary with Van Rijswijck was Van Beers, the poet, famous for his *Levensbeelden, Gevoel en Leven*, and his long epic *Begga.* Following Conscience came a line of novelists, of whom Delcroix, author of *Geld of Liefde* and *Philippine van Vlaanderen*, Sleeckx, who wrote *Volksverhalen, In 't Schipperskwatier, Op 't eksterlaar*, and *Dirk Meyer*, and Snieders, well known for his *De gasthuisnon.* Romanticism found an exponent in Bergmann's *Verspreide schetsen en novellen* (written under the pseudonym of 'Tony'). A new generation arose—one which had not to create, but to develop, a movement. Here are prominent the names of Dantzenberg, whose *Volksliederen* were followed by the poems of De Cort and Van Droogenbroeck. The novel, to which Conscience had contributed so copiously, also received fresh inspiration in Madame Courtmans, who wrote fifty-eight romances, of which the most important are *Roza van den Buschkant, Moeder Daneel, Het plan van Heintje Barbier, De Koewachter*, and *Het rad der fortuin.* Two poetesses, the sisters Rosalie and Virginie Loveling, are important figures in the literature of Flanders; and their novels, such as *Broeder en Zuster, M. Damien en zijne erfgenamen*, by Rosalie, and *Sidon, Emiliaantje*, and *Octavie en Estelle*, by Virginie, are also worthy of note. Of the West Flemish authors the chief is the Abbé Guido Gezelle, whose poems preach the piety of the Church militant in his *Dichtoefeningen* and his *Gedichten, Gezangen en Gebeden.* The drama has also been developed by the Flemish, who tend especially, like the Dutch, toward comedy. Especially noteworthy productions in this branch of literature are the *Meester en knecht* and *Zannekin* of Sleeckx, besides a large number of less important plays.

Consult: Schuermans, *Algemeen Vlaamsch Idioticon* (Louvain, 1856-70); De Bo-Samyn, *West Vlaamsch Idioticon* (2d ed., Ghent, 1892); Delepierre, *Sketch of the History of Flemish Literature* (London, 1860); Vercoullie, *Spraakleer van het Westvlaamsch* (Ghent, 1894); Adriaensen, *Vlaamsche Poezie* (Zütphen, 1889); Stecher, *Histoire de la littérature néerlandaise en Belgique* (Brussels, 1887); Arjuna, *Die vlämische Bewegung* (Cöthen, 1897); Hamelius, *Histoire politique et littéraire du mouvement flamand* (Brussels, 1894); Snellaert and de Potter, *Vlaamsche bibliographie* (Ghent, 1857 et seq.).

FLEMMING, PAUL. See FLEMING, PAUL.

FLEMMING, WALTER (1843—). A German anatomist. He was born at Sachsenberg, Germany, April 21, 1843. He studied at Göttingen, Tübingen, Berlin, and Rostock. He was privatdocent in the last-named place in 1871, in Prague in 1872, and since 1876 he has been professor of anatomy in Kiel. His contributions to the knowledge of the finer structure of the cell, and of the process of mitosis, have been very important. He has written *Zellsubstanz, Kern und Zelltheilung* (1882); *Beiträge zur Kenntniss der Zellen und ihrer Lebenserscheinungen* (1879-81); *Studien über Regeneration der Gewebe* (1885); *Neue Beiträge* (1887-91).

FLENSBURG, flĕns′bōōrk. A town in the northern part of the Prussian Province of Schleswig-Holstein, pleasantly situated at the end of the Flensburg Fiord, on the Baltic, about 40 miles northwest of Kiel (Map: Prussia, C 1). The buildings worthy of mention are the Marienkirche, the Nicholaikirche, the court-house, and the theatre. The Flensburg Lion in the old churchyard dates from 1853, and was erected by the Danes to commemorate their victory at Idstedt. It was taken to Prussia by the Germans in 1864. The old cemetery is noteworthy, and contains a sphinx by Thorwaldsen. The fiord is a beautiful stretch of water, and the whole vicinity is attractive. The industries include ship-building, the manufacture of iron and machinery, the production of paper, cloth, carpets, cement, and vinegar. There are oil and rice mills. The city's trade is largely in grain, lumber, coffee, sugar, horses, and fat cattle. The fisheries are productive. Flensburg is the official town of the circle. Population, in 1895, 40,840; in 1900, 48,922. The town dates from the twelfth century. Queen Margaret, founder of the Union of Kalmar, died here in 1412. Flensburg was captured twice in the Thirty Years' War, and has suffered much from military campaigns. Severe battles were fought in its vicinity in the Schleswig-Holstein wars.

FLERS, flâr. A town in the Department of Orne, France, 41 miles by rail from Alençon (Map: France, F 3). It has an old castle, dating from the sixteenth century, and a Norman church. There are considerable manufactures of linen, fustian, and especially of ticking. Population, in 1901, 13,680.

FLESH (AS. *flæsc*, OHG. *fleisk*, Ger. *Fleisch*, flesh, Icel. *flesk*, pork). The ordinary term for animal tissues, excluding bone. After the removal of the blood-vessels, nerves, cartilage, viscera, connective (or cellular) tissue, and areolar tissue, the resulting muscle (q.v.) is popularly called flesh. Numerous analyses have been made of the muscular substance of various animals. The following table gives the determinations of the individual constituents of beef freed as far as possible from blood-vessels, and may be regarded as fairly representing the composition of flesh generally:

CONSTITUENTS	Percentage amounts	
Water	From 75.00	to 77.00
Solid constituents	" 25.00	" 13.00
	From 100.00	to 100.00
The solid constituents include:		
Muscular fibre	From 13.00	to 18.00
Gelatinous substance	" 0.60	" 1.90
Albumen	" 2.20	" 3.00
Kreatin	" 0.07	" 0.14
Kreatinin	undetermined	
Inosic acid	"	
Fat	From 0.50	to 3.00
Lactic acid	" 0.60	" 0.68
Phosphoric acid	" 0.66	" 0.70
Potash	" 0.50	" 0.54
Soda	" 0.07	" 0.09
Chloride of sodium	" 0.04	" 0.09
Lime	" 0.02	" 0.03
Magnesia	" 0.04	" 0.08

This list, however, does not include all the ingredients of flesh. In the freshly expressed muscular juice, which exhibits a strong acid reaction, we also find small quantities of proteids (myosin, muscle-albumen, and hæmoglobin), acids (sarcolactic acid and acid phosphates), salts of potassium and sodium, mineral substances (phosphoric acid and potash), and extractives (either basic substances or amides, as kreatin, xanthin, carnin, and carnic acid—all representing the fragments of broken-down proteids and of no use as tissue-builders). There are also found hypoxanthin and formic, butyric, and acetic acids, which may all be products of decomposition, uric acid, and urea, and inosit (q.v.). Bernard discovered glycogen (q.v.) in the muscles of the embryos of various animals.

The dried flesh of the ox is practically identical in its ultimate composition with dried blood, as is shown by the following analyses, which were made by Playfair:

CHEMICAL COMPONENTS	Beef	Ox-blood
Carbon	51.83%	51.95%
Hydrogen	7.57	7.17
Nitrogen	15.01	15.07
Oxygen	21.37	21.39
Ash	4.23	4.42

For further information on the subject, consult: Liebig, *Researches on the Chemistry of Food*, translated by Gregory (Edinburgh, 1847); Lehmann, *Physiological Chemistry*, vol. iii. (London, 1853); Gamgee, *Physiological Chemistry* (London, 1880); Hutchison, *Food and the Principles of Dietetics* (London, 1900). See also bibliography under CHEMISTRY, PHYSIOLOGICAL.

FLESH-BIRD, or **MEAT-BIRD.** Names given in various parts of the world to birds that come about camps or ships and devour fragments of meat. In North America they refer to the Canada jay. See JAY.

FLESH-FLY, BLOW-FLY, or **MEAT-FLY.** Any of several large, noisy, blue or green flies of the house-fly type, which lay their eggs on exposed wounds, meat, or carrion. A very conspicuous one is a large 'blue-bottle' fly (*Calliphora erythrocephala*), rather dull in color, with a rust-red forehead and black spines on the thorax. It is the common 'blow-fly' of Europe, whose maggots are called 'gentles' and used as bait by English anglers. Another familiar British species (*Sarcophaga carnaria*) is rarely seen in America, where its place is taken by a similar scavenger-species (*Sarcophaga sarraceniæ*). A third well-known American species is the green-bottle (*Lucilia cæsar*), which often enters houses. This and the preceding species frequently lay their eggs in the putrid mass of insects caught by the plants of the fly-trap (Sarracenia). In the Western States a most troublesome kind is the screw-worm fly (*Compsomyia macellaria*), which ranges throughout the warmer regions of both Americas, and sometimes attacks wounds or diseased parts (as the nostrils) of men as well as domestic animals. Indeed, the evil effects of several sorts of flesh-flies (including the small gray ones of the genus Helicobia) are referred to in medicine by the term miasis. The stable-fly (*Stomoxys calcitrans*) should also be mentioned here.

The breeding habits and life history of all these flies are essentially similar. The eggs are laid in packets on dead animals or upon raw or even cooked meat, each packet containing from 3 to 100 eggs. The instincts which guide the fly to just the food its larvæ will require are as precise as they are curious. Prof. Jacques Loeb records in his *Physiology of the Brain* (New York, 1900) that where pieces of lean meat and of fat from the same animal were exposed together "the fly never failed to lay its eggs on the meat and not on the fat;" furthermore, he was unable to rear the larvæ on the fat. He believes the attraction and choice are due to chemitropism in the parent fly. The larvæ issues in from twenty to twenty-four hours, and buries itself in the carrion, feeding continuously for two weeks, when it crawls aside into some protected place and transforms to pupa, in which stage it remains from two days to several weeks. There are several generations each year, and the part which these insects play in the rapid removal of decaying carrion is very important. Unfortunately these insects also attack the fresh wounds of living animals, with most injurious effects; and Packard states, in regard to *Calliphora vomitoria*, that it grievously tormented wounded soldiers on the battlefield during the Civil War. Careful cleaning of infected wounds of animals with dilute carbolic acid, and covering them with a dressing of tar, are remedial measures. Consult: Osborn, "Insects Affecting Domestic Animals," in *United States Department of Agriculture, Division of Entomology, Bulletin 5* (Washington, 1896). See FLY; TSETSE.

FLESHLY SCHOOL, THE. A name given to a group of nineteenth-century poets, headed by

Swinburne, Rossetti, and Morris, in allusion to the sensuous atmosphere of their writings. The term originated as the title of an article by R. W. Buchanan in the *Contemporary Review*: This article was signed with the pseudonym Thomas Maitland, and was afterwards published separately (London, 1872) under the title, *The Fleshly School of Poetry and Other Phenomena of the Day.*

FLESSELLES, fle-sĕl′, Jacques de (1721-89). A French official in the earliest days of the Revolution. He was master of requests, and then became supervisor at Moulins (1762), and in Brittany (1765), where he sided with d'Aiguillon and de Saint Florentin against Parliament and La Chalotais (q.v.). He showed himself a clever officer at Lyons, where he went in 1767, and became popular for his unwilling acquiescence in the policy of Turgot and later for his administration of the Government in the 'paternal' mode. He became Councilor of State in 1784 and was one of those blamed for the Pact of Famine, by which, so thought the people, the royal Government had combined with the grain merchants to raise the price of breadstuffs. In 1789 he was made provost of Paris tradesmen. He was proved guilty, after the taking of the Bastille, by a note found on de Launay, of attempting to deceive the people. The mob started with him to the Palais Royal, but he was shot on the way, his body horribly mutilated, and the head carried on a pike through the streets.

FLES′TRIN, Quinbus (Man Mountain). A name given to Gulliver by the Lilliputians in Swift's *Gulliver's Travels.*

FLE′TA. The title of an ancient English law book, popularly attributed to one of the learned judges of the time of Edward III., but of wholly unknown authorship. Its title is supposed to be derived from the fact of its having been written in the Fleet Prison. It is one of a numerous class of legal text-books, founded upon the great work of Bracton (q.v.), which appeared toward the close of the fourteenth century. It never had any considerable authority, and is inferior in arrangement as well as in originality to the treatise attributed to Britton (q.v.), which was written at about the same time and with which it is often compared. Consult J. Sheldon's *Dissertation on Fleta,* R. Kelham, translator (London, 1771).

FLETCH′ER, Alice Cunningham (1845—). An American ethnologist and worker for the betterment of the American Indians. She was born in Boston, Mass. In 1892 she was awarded the Thaw Fellowship, in the Peabody Museum of Harvard University, and as vice-president of the American Association for the Advancement of Science (1896), vice-president of the Anthropological Society (1899), and an officer in the American Folk-Lore Society (1888) and the Archæological Institute of America (1879), she became widely known in American scientific circles. As a worker for the American Indians she originated the plan whereby, through small loans, they are encouraged to buy land and build houses. In 1883 she was appointed United States special agent to allot the Omaha tribes their lands in severalty, and in 1887 she acted in the same capacity for the Winnebago and Nez Percé tribes. Tact, sympathy, and a just appreciation of the Indians enabled her to discharge all these missions successfully, and incidentally endeared her to the tribes for whom she worked. In 1893 Miss Fletcher was one of the judges in the Anthropological Department of the World's Columbian Exposition, and she was also appointed a member of the advisory board in the department of anthropology in the University of California. Her publications include monographs upon American ethnological subjects, such as *Indian Ceremonies* (1884), and *A Study of Omaha Indian Music* (1893), published by the Peabody Museum; *The Import of the Totem* (1897), published by the Smithsonian Institution; other monographs published by the United States Bureau of Ethnology; various articles in *The Anthropologist*, the *Folk-Lore Journal*, and *Science;* a *Report on Indian Civilization and Education*, published by the United States Senate; and *Indian Song and Story for North America* (1900), a unique collection of native music gathered from the Omaha, Pawnee, and other Western tribes, and accompanied by translations and explanatory texts, which has already borne fruit by suggesting American compositions.

FLETCHER, Andrew (1655-1716). A Scotch patriot and publicist. He was born in Saltoun, East Lothian. His father, Sir Robert Fletcher, dying when his son was ten years of age, committed him to the care of Gilbert Burnet, who superintended his education for five years. In 1681 he sat in Parliament as commissioner for East Lothian. Prior to this he had strongly opposed Lauderdale's policy, and now offered a determined opposition to the test oath and to the Duke of York's oppressive measures. He was obliged to flee to Belgium; but fearing arrest by Spanish agents, he secretly returned to England, and after the Rye House Plot, in which he had counseled moderation, he joined the Duke of Monmouth in Holland. He landed with Monmouth's expedition at Lyne, Dorsetshire, but in a quarrel about a horse, shot a local ex-alderman, a fellow-campaigner, and fled to Spain for safety. The authorities imprisoned him when he landed; but he made a romantic escape, and after traveling in disguise through Spain, reached Hungary, where he fought as a volunteer against the Turks. He joined William of Orange at The Hague in 1688, and in the Revolution returned to Scotland. His policy was now to create a Scotch Home Rule Party. After the Union he retired from public life and devoted himself to agriculture. Among his improvements was the introduction of winnowing fanners and of pot barley into Scotland. His polemical tracts, which appeared anonymously, were collected and published after his death. Consult: Fletcher, *Political Works* (London, 1732); Erskine, *Essays on the Lives and Writings of Fletcher*, etc. (London, 1792); Omond, *Fletcher of Saltoun* (New York, 1897); Burnet, *History of His Own Time* (6 vols., Oxford, 1833); Dalrymple, *Memoirs of Great Britain and Ireland* (London, 1873); Wodrow, *History of the Sufferings of the Church of Scotland* (Edinburgh, 1842).

FLETCHER, Benjamin. A Colonial Governor of New York, from 1692 to 1698. The date and place of his birth and the date of his death are unknown. By profession a soldier, he served in the Low Countries and in Ireland, and in 1692 was appointed Governor of New York by William and Mary. In 1693-94 he also acted as Governor of Pennsylvania, William Penn having been temporarily deprived of his proprietary rights. He was strongly opposed in New York by the Leisler faction, and by the Independents in religion, by whom he was accused of accepting bribes, interfering with elections, and encouraging piracy; and in 1698 he was replaced by Bellomont (q.v.). For an account of his administration, consult Wilson, *Memorial History of the City of New York*, vol. i. (New York, 1892).

FLETCHER, Giles and Phineas. English poets, cousins of John Fletcher, the dramatist, and sons of Giles Fletcher, Queen Elizabeth's Ambassador to the Court of Russia. Giles (c.1588-1623), the younger of the two brothers, was educated at Cambridge, and died at his living at Alderton, Suffolk. His chief poetical work is a sacred poem, entitled *Christ's Victory and Triumph*, written and published at Cambridge (1610). It contains scattered passages of great splendor.—Phineas (1582-1650) was educated at Eton and Cambridge, and became rector of Hilgay, in Norfolk, in 1621, where he died. His most important poem is the *Purple Island: or, the Isle of Man* (1633). It contains an elaborate description of the human body and mind, the former being given with great anatomical minuteness. The mind is represented as being beleaguered by the vices, and likely to be subdued, when an angel comes to its aid. Although the poem is formal and pedantic in design, the thought and movement are at times majestic. The Fletchers are known as Spenserians, because they imitated to an extent the stanza and the theme of the *Faerie Queene.* On the other hand, they look forward to Milton, who read them carefully. Their works were edited by A. B. Grosart for the *Fuller Worthies Library* (1868).

FLETCHER, John. See Beaumont and Fletcher.

FLETCHER, or **DE LA FLECHERE,** John William (1729-85). An English clergyman. He was born in Switzerland, and was educated at Geneva. He was intended to be a clergyman, but so disliked extreme Calvinistic doctrines that he entered the army of Portugal, and afterwards obtained a commission in Holland. Without having actually been in the Dutch service, however, he went to England, where he became a tutor. He joined the Methodist Society, and in 1757 took orders. In 1760 he was appointed Vicar of Madeley, where he continued an exceedingly active and successful ministry. From 1768 to 1771 he was superintendent of the theological college founded by the Countess of Huntingdon at Trevecca, Wales. He took sides with the Arminians in the Calvinistic controversy, was a supporter of John Wesley, after whose methods he conducted many of the religious exercises in his parish, and wrote his most important volume, *Checks to Antinomianism* (1771), in justification of the minutes adopted by the Wesleyan Conference in 1770. His further works include *An Essay on Truth* (1773). Consult his life by J. Manat (London, 1902).

FLETCHER, Julia Constance (1858—). An American author, whose pseudonym was 'George Fleming.' She was born in Brazil in 1858, where her father, the Rev. James Cooley Fletcher, was stationed first as missionary, and after being educated in the United States and abroad, made her home in Rome. One of her plays appeared at the Empire Theatre, New York, in 1897—*A Man and His Wife.* Among her other writings are: *The Head of Medusa* (1880); *Vestigia* (1884); and *Andromeda* (1885).

FLETCHER, Richard (c.1543-96). An English bishop, a courtier of Elizabeth. He was educated at Corpus Christi College, Cambridge; was Prebend of Islington in 1572; married Elizabeth Holland in the following year, and in 1574 was minister at Rye and was presented to Elizabeth by Archbishop Parker. He was a good preacher, and did so well in his attempts to please the Queen that he was made Vicar of Bradenham (1575), Court Chaplain (1581), Dean of Peterborough (1583), and Prebendary of Stow Longa at Lincoln Cathedral, and Rector of Barnack and of Algakirk (1586). He preached before Mary Stuart's judges, and distinguished himself as chaplain at her execution by his bid for Elizabeth's favor. In 1589 he was made Bishop of Windsor, but lived most of his time at Court. In 1592 his wife died. In the same year he was made Bishop of Worcester, and two years afterwards became Bishop-elect of London. But the Calvinism of the Lambeth Articles, which he helped frame, and still more his second marriage with a widow of small reputation, angered the Queen; he was forbidden to come to Court, and was suspended from office (1595). A year later he died. He left eight children, one the famous dramatist, John Fletcher.

FLETCHER, Robert (1823—). An American surgeon and anthropologist, born in Bristol, England. He graduated at the Royal College of Surgeons of England in 1841, became surgeon of the First Ohio Volunteer Infantry in 1861, and subsequently was appointed principal assistant librarian in the library of the Surgeon-General's office, United States Army, Washington, D. C. He also served as professor of medical jurisprudence in the Columbian University, and as president of the Anthropological Society of Washington. His writings include: *Paul Broca and the French School of Anthropology* (1882); *Human Proportion in Art and Anthropometry* (1883); *The New School of Criminal Anthropology* (1891); and *Scopelism* (1897; read before the Anthropological Society of Washington).

FLEUR-DE-LIS, flẽr′ de-lē′ (Fr., flower of the lily). A conventionalized form of the iris-plant. As a motive in ornament, it goes back to the days of the Etruscans, or earlier. It became the emblem of the kings of France after 1280. Many fanciful explanations are given to account for its adoption, but none has any authority. In 1376 Charles V. fixed the form of the French king's coat of arms definitely, *Azure, à trois fleurs-de-lis d'or*, i.e. three golden fleurs-de-lis on a blue field. See Iris.

FLEUR D'ÉPINE, flẽr dȧ′pēn′, Histoire de (Fr., History of Thorn-flower). A 'conte,' or highly romantic tale, written by Anthony Hamilton in the early part of the eighteenth century. It is a burlesque on the numerous imitations of the *Arabian Nights' Entertainments*, then in vogue. An edition appeared in France in 1749, and an English translation of all the author's '*contes*,' in London, in 1760.

FLEUR ET BLANCHEFLEUR, flẽr ȧ blänsh′flẽr′. See Flore et Blanchefleur.

FLEURIAIS, flẽ′rē-ȧ′, Georges Ernest (1840—). A French naval officer, born in Paris. After graduation from the Ecole Navale in 1857, he entered the French Navy, rose to be *capitaine de vaisseau* in 1883, and rear-admiral in 1892. He saw service in Mexico in the contest incident to the establishment of the empire of Maximilian, and during the Franco-Prussian War was successively aide-de-camp to Admiral Bonet-Willaumez, commanding the North Sea Squadron, and a soldier in the Army of the Loire. During the war against China, in 1884-85, he commanded the armored cruiser *La Galisonnière*. He was at various times intrusted with important scientific missions, such as the determination of certain meridians by lunar observations (1867-70), and the observation of the transit of Mercury at Payta, Peru (1878). He received, in 1874 and 1882, the Prix Lalande and the Prix Plumey respectively, for improvements made by him in instruments of navigation.

FLEURIEU, flẽ′rē-ẽ′, Charles Pierre Claret (1738-1810). A French naval officer, born in Lyons. He entered the French Navy in 1751; in 1768-69 was commander of the *Isis* in an expedition sent out for the trial of the chronometer, or marine watch, in whose invention he had assisted Berthoud, and in 1776 became inspector-general of navy-yards and ports. In 1778-83 he made the plans to be followed in the naval war against England, by way of aiding the American Colonies in their struggle for independence. From 1790 to 1791 he was Minister of the Navy, in 1800 was appointed by Napoleon to the Council of State, and later became successively Senator (1805), Admiral (1806), and Governor of the Tuileries (1808). He was Minister Plenipotentiary for the signing of the treaty by whose terms Louisiana was ceded to the United States. He published a history of the Spanish conquerors of America (1800).

FLEURUS, flẽ′ru̧s′. A small town of Belgium, in the Province of Hainaut, situated near the left bank of the Sambre, and 15 miles west of Namur. Population, about 5200. Fleurus has been the scene of at least four important battles. Here, on August 29, 1622, the Protestant Army, under the Duke of Brunswick and Count Mansfeld, repulsed the Spaniards under Cordova. On July 1, 1690, Marshal Luxembourg defeated the Dutch and the Germans. On June 26, 1794, Jourdan, after an obstinate and bloody conflict at Fleurus, forced 80,000 of the Allies, under the Prince of Saxe-Coburg, to retreat from the Sambre and to evacuate Flanders, thereby saving France from invasion. On June 16, 1815, Napoleon defeated the Prussians near Fleurus, though the battle is better known as the battle of Ligny (q.v.).

FLEURY, flẽr′ĭ (from Fr. *fleuré*, flowered, from *fleur*, flower, from Lat. *flos*, flower). A term in heraldry signifying that an object is adorned with fleurs-de-lis or parts of the fleur-de-lis; also written flory, flowry, fleurette, etc. A cross fleury is a cross the ends of which are in the form of the fleurs-de-lis, and is distinguished from a cross patonce in that the limbs in the latter are in the form of the segments of a circle, and terminate in a mere bud, whereas the cross fleury has the limbs straight and the ends distinctly floriated. See Heraldry.

FLEURY, flẽ′rē′, André Hercule de (1653-1743). A French cardinal-bishop and chief Minister during the early part of the reign of Louis XV. He was born June 26, 1653, at Lodève, in Languedoc, and after an excellent education at Paris entered the Church, and became a canon at Montpellier. In 1679 he was called to be almoner to Marie-Thérèse, wife of Louis XIV., and after her death he became royal almoner (1683), and received many preferments, including the Abbey of Rivour and the bishopric of Fréjus. In 1715, in accordance with the dying wish of Louis XIV., Fleury became tutor to the young Louis XV., then only five years old, over whom he succeeded in establishing a complete ascendency. When the King reached his majority Fleury was made a member of the Council of State, and in 1726, when the Duc de Bourbon was dismissed, he became virtually Prime Minister, though he did not assume that title, and contented himself with the dignity of cardinal, which he received in the same year. By strict economy and a wise internal policy, Fleury raised France from a state of commercial depression; but he was unfortunate on the whole in his external policy, which embraced the play of politics attendant upon the Polish and Austrian wars of succession. The last of these wars he did not live to see terminated, for he died while still in office, in 1743, at the age of ninety. One of the most praiseworthy acts of his administration was the completion of the Bibliothèque Nationale at Paris. He was a scholarly man himself, and a member of the various French academies. Consult: Lacretelle, *Histoire du dix-huitième siècle* (Paris, 1830); Verlaque, *Histoire du cardinal Fleury* (Paris, 1879); Perkins, *France Under the Regency* (Boston, 1892).

FLEURY, Claude (1640-1723). A French Church historian, born in Paris. He was educated by the Jesuits, and at first practiced law (1658-67); but preferring an ecclesiastical career, took priest's orders, and became tutor to the young princes of Conti (1672), and later (1680) to the Comte de Vermandois, natural son of Louis XIV. After the death of the Count, the King appointed him, in 1684, Abbot of the Cistercian Monastery of Loc-Dieu, and in 1689 tutor to the royal grandchildren, the dukes of Burgundy, Anjou, and Berri. In 1696 he was elected to the Academy, and in 1706 became prior of Argenteuil. The Duke of Orleans appointed him confessor to the young King, Louis XV., in 1716, and he held this office till compelled to resign by the infirmities of age in 1722. Fleury was a man of much learning, kind-hearted and simple in manners, and upright in conduct. Of his numerous works may be mentioned: *Les mœurs des Israélites* (1681); *Les mœurs des Chrétiens* (1682); *Traité du choix et de la méthode des études* (1675); *Institution du droit ecclésiastique* (1687); and, most important of all, the *Histoire ecclésiastique* (20 vols., 1691-1720). This work was the labor of thirty years, and is marked by learning and a judiciously critical spirit. J. H. Newman prepared an English translation of the part from the Second Ecumenical Council (Oxford, 1842-44). Fleury's part extends only to 1414, but his continuators have brought it to 1546 in the Paris edition of 1836-37. In the Latin translation (Augsburg, 1758-94) it is continued to 1768. The so-called *Abrégé de l'histoire ecclésiastique de Fleury* (Bern, 1766) has a preface by Frederick the Great. He was a stanch Gallican, and his posthumous work, *Discours sur les libertés de l'église gallicane* (1724), has been very popular. His *Complete Historical Catechism*, continued to Pius IX., appeared in London (1871). For his biography, consult the Paris edition of his works (1837).

FLEURY, Emile Félix (1815-84). A French general, born in Paris. He became a volunteer in the Spahis in Algeria in 1837, fought bravely, and became captain in 1844. He took an active part in the coup d'état of 1851. In the following year he organized the regiment of the *Guides,* of which he became commander. In 1856 he was promoted to the rank of brigadier-general, became chief aide-de-camp to the Emperor, and, in 1865, Senator. In 1866 he was sent as Ambassador to Florence, and in 1869 as Ambassador to Russia. After 1870 he retired from active service.

FLEURY, François Louis Teisseidre, Marquis de (1749-94). A French soldier, who served in the American Army during part of the Revolutionary War. He was born at Saint Hyppolite in Languedoc, served in Corsica in 1768 and 1769, and in 1776 came to America for service in the Patriot Army. He became a captain of engineers in May, 1777; was appointed brigade-major to Pulaski in October of that year; was wounded at Fort Mifflin (q.v.) in November, where he was engineer-in-chief; was promoted to be lieutenant-colonel in the same month; was second in command of a picked corps of 600 men in the battle of Monmouth; served under Sullivan in Rhode Island; and at the beginning of the campaign of 1779 was placed in command of a regiment of light cavalry. In July, 1779, the Continental Congress voted him a silver medal for his gallantry at Stony Point, where he led the right column, was the first person to enter the fort, and tore away the British flag with his own hands. Late in 1779 he returned to France, but subsequently took part in the siege and capture of Yorktown. In December, 1781, he received the rank of chevalier of Saint Louis, and he ultimately attained the rank of *maréchal de camp* in the French Army.

FLEURY, Jean François Bonaventure (1816-94). A French teacher and author, born at Vasteville. He was educated at Cherbourg as bursar; then became a journalist; but after the coup d'état of December 2d he devoted himself to teaching. In 1858 he went to Russia as a private tutor, and later was in public education. In 1872 he became professor at the Saint Petersburg School of Law, and a little afterwards reader in French in the university. He returned to France about 1890. Among his works mention should be made of the following: *Vie de Bernardin de Saint Pierre* (1843); *Krylov et ses fables* (1862); *Essai sur le patois normand de Hague* (1866); *Rabelais et ses œuvres* (1877); *Marivaux et le Marivaudage* (1881); *Littérature populaire de la Basse Normandie* (1883). Fleury's daughter married Henry Gréville.

FLEURY, Maurice de (1860—). A French physician, born at Bordeaux. He was educated in the university there, in which his father, Armand de Fleury, was professor. He was on the staffs of the hospitals of Bordeaux, and later at Paris. He made a special study of nervous complaints, and wrote much on the education and health of children. Among his works are: *Contribution à l'étude de l'hystérie senile,* a doctoral thesis (1890); *Traitement rationnel de la neurasthénie* (1894); *Pathogénie de l'épuisement nerveux* (1896); *Introduction à la médecine de l'esprit* (1897); *L'âme du criminel* (1899); and *Le corps et l'âme de l'enfant* (1899).

FLEURY DE CHABOULON, de shȧ'bōō'lôɴ', Pierre Alexandre Edouard, Baron (1779-1835). A French legislator and secretary of Napoleon I. He was an ardent patriot, and was scarcely sixteen when he was selected as commander of a battalion of the National Guard. After serving in the Ministry of Finance and as an auditor of the Council of State, he played a distinguished part as a subprefect of the Department of the Meurthe. His services attracted the attention of Napoleon, who in 1814 appointed him auditor at army headquarters, and subsequently sent him as prefect to Rheims, which city he placed in a state of defense against the allied armies. Upon the return of Napoleon from Elba he became his private secretary. Banished after the Emperor's final deposition, he went to London, where he wrote his celebrated *Mémoires pour servir à l'histoire du retour et du règne de Napoléon en 1815* (1819; Eng. trans., 1820; German trans., by Bergk, 1821).

FLEURY-HUSSON, ụ'sôɴ', Jules. See Champfleury.

FLEXURE (from Lat. *flexura,* curve, from *flectere,* to bend). This term denotes the bending of loaded beams. If a beam, supported at its two ends, be loaded, it bends, its lower surface becoming convex and its upper concave. In this bending the fibres in the lower surface are stretched, and those in the upper are compressed, while between these surfaces there is one called the 'neutral' surface, wherein the fibres are neither stretched nor compressed. Experiments show that the flexure of solid beams supported at their ends and loaded varies (1) directly as the load; (2) inversely as the product of their *breadths* and the cube of their *depths;* and (3) directly as the cube of the distance between the supports. Since flexure is primarily a phenomenon of stretching and compression, the coefficient of elasticity involved is Young's modulus. See Elasticity; Strength of Materials.

FLIB'BERTIGIB'BET. (1) In Shakespeare's *King Lear,* a fiend mentioned by Edgar. (2) In Scott's *Kenilworth,* a mischievous, impish boy, Dickon Sludge. He lives near Wayland Smith's forge, and later appears at the festival at the castle.

FLICKEL, Paul (1852—). A German landscape painter, born in Berlin, pupil of Theodor Hagen at the School of Art in Weimar. He worked independently at Düsseldorf, and from 1876 in his native city. His views from Italy, which he visited in 1877, bring home especially the luxuriance of southern vegetation, and all his landscapes, for which latter he selected scenery near the coast of the Baltic and in the Harz Mountains, are remarkable for beautiful sunlight effects. A "Beech-wood Near Prerow" (1886) was awarded the great gold medal, and is now in the National Gallery, Berlin. Among others may be noted "The Ilse Valley in the

Harz" (1888), "Sylvan Solitude" (1892). He was made professor in 1894.

FLICKER (onomatopoetic, from the bird's note). The popular name of one of the commonest and handsomest birds in the eastern United States, the golden-winged woodpecker (*Colaptes auratus*). It is a little more than a foot in length, and the bill, which is an inch and a half long, is slender and somewhat curved, very unlike the ordinary woodpecker's bill. The back is olive brown, barred with black, while the rump and upper tail-coverts are pure white; the top of the head and the sides of the neck are ash, with a bright scarlet nuchal band; the under parts are lilac-brown anteriorly, fading into creamy yellow posteriorly, marked with numerous circular black spots; a broad, black crescent crosses the breast; the wings and tail are on the under side bright golden yellow. When the bird flies the white rump is very prominent, and makes the recognition of the flicker easy. This beautiful woodpecker is found throughout North America, as far west as Alaska, but in the United States it is confined to the country east of the Rocky Mountains. In the northern part of its range it is migratory, but it winters from Massachusetts and Illinois southward. It nests, like all woodpeckers, in holes in trees, and the eggs are white, five or more in number. When the nest is robbed the female will continue to lay, until sometimes more than twenty eggs have been taken from one nest. The flicker feeds on worms, insects, and berries, and is often seen on the ground in search of food. The notes are varied, but the most familiar is a rapidly repeated, rolling call. There is also a frequent two-syllabled note, uttered in a high, nasal tone. The flicker enjoys the distinction of having more numerous popular names than any other American bird. No less than thirty-six have been recorded, the most common of which, besides the two already given, are high-hole, or high-holder, referring to the position of the nest; pigeon woodpecker, referring to the size and appearance on the ground; clape and yucker, which, like flicker, are supposed to imitate one of its notes; and yellowhammer, referring to the color of the under surface of the wings and its woodpecker habit of drumming on dead limbs.

The red-shafted flicker (*Colaptes Mexicanus*), west of the Rocky Mountains, is like the common flicker in color, except that the under side of the wings and tail is orange-red, and there is no red nuchal band; in habits it is exactly like the Eastern bird. A third species occurs in the valley of the Colorado River and southward, and three other species of the genus are found in the warmer parts of America.

Consult: Coues, *Birds of the Northwest* (Washington, 1874); Ingersoll, *Wild Life of Orchard and Field* (New York, 1902). See Woodpecker; Dimorphism; and Plates of Woodpeckers, and of Eggs of Song-Birds.

FLICK'INGER, Daniel Kumler (1824—). An American divine. He was born at Sevenmile, Ohio, and was for nearly thirty years secretary to the United Brethren Church Missionary Society, on behalf of which he made numerous tours in Africa, in the capacity of foreign missionary bishop. His experiences in the Dark Continent are related in the interesting works entitled: *Offhand Sketches of Men and Things in Western Africa* (1877); *Ethiopia: or, Twenty Years of Missionary Life in Western Africa* (1877); *The Church's Marching Orders* (1879).

FLIEDNER, flēt′nẽr, Theodor (1800-64). A German philanthropist. He was born at Eppstein, Nassau, the son of a clergyman, and after studying at the universities of Giessen and Göttingen, became pastor of a small church at Kaiserswerth. He made a tour through Germany, Holland, and England to raise funds in behalf of his poor parish, and his success suggested to him the idea of his benevolent institutions, and especially prison reform. The German prisons were then in a very bad state; but those interested in their improvement banded together, and in 1826 the first Society for Prison Reform of Germany was founded. Fliedner realized that the first step must be toward looking after the prisoners on their release, and accordingly, in 1833, he opened at Kaiserswerth a refuge for discharged female convicts. To take care of the sick and poor, a hospital was built and a body of women trained for nursing. King Frederick William IV. of Prussia, and his Queen, Elizabeth, gave Fliedner their support, and founded a Christian hospital with deaconesses at Berlin. His last years were spent founding 'mother houses' in Europe, America, and the East, and he wore out his life in his work. Fliedner paid no attention to the great controversies that were disturbing the German Church, but gave his whole attention to well-directed efforts for the good of the poor and suffering. The sterner features of his character were relieved by a humor that had full play in his intercourse with the children of his schools. Consult Winkworth, *Life of Pastor Fliedner of Kaiserswerth* (trans., London, 1867).

FLIEGENDE HOLLÄNDER, flē′gen-de hôl′lĕn-dẽr, Der (Ger., *The Flying Dutchman*). An opera composed and written by Wagner (1843).

FLIES, Spanish. See Blister-Beetle.

FLIGELY, flē-gā′lē, August von (1811-79). An Austrian soldier, born at Janow, Galicia. He was director of the Military Geographical Institute at Vienna from 1853 to 1872 and president of the Austrian Geodetic Commission until 1875. His work in the department of triangulation, geodesy, and cartography was very important, and the Military Geographical Institute of Austria owes its present fame to his influence and activity. The employment of heliogravure in the preparation of the new special atlases of Austria was due to his initiative.

FLIGHT (AS. *flyht*, from *flēogan*, Icel. *fljūga*, OHG. *fliogan*, Ger. *fliegen*, to fly). The power of progressing through the air by means of wings. It is possessed by bats and birds among existing vertebrates, by the extinct pterodactyls, or flying reptiles, and by a very large proportion of insects. No amphibian can fly, the nearest approach to flight being found in a frog (Rhacophorus) of Borneo, in which the webbed feet are so large as to serve the purpose of a parachute. That flying fishes actually 'fly' has been asserted and denied with equal vigor; but very careful observers insist that the pectoral fins are active and not merely passive agents in sustaining the fish after it has sprung into the air. It is certain that if a flying fish is laid on the deck of a vessel the outstretched fins are often vibrated with great rapidity and considerable force.

Mechanism for Flight. The wings of vertebrates are modifications of the fore limbs; these in bats and pterodactyls support, or supported, a thin membrane, while in birds the bones support stiff feathers. In bats the thumb is free, the bones corresponding to the fingers of man greatly elongated. The membrane is not only spread between these, but continued from the little finger to the ankle-joint, while there is, in addition, a greater or less amount of membrane sustained between the legs and tail, which helps support the body during flight. In pterodactyls the thumb was absent, the succeeding three fingers very small, the fifth or little finger enormously elongated. This supported the wing-membrane in front, while the hinder margin reached to the ankle-joint, or possibly in some species only to the hip. In birds the bones of the hand are reduced in number, and some of them are fused, to furnish a point of attachment for the feathers. In bats the strain of the wing is sustained by the greatly developed collar-bone, or clavicle, which runs from the shoulder-blade to the front end of the breast-bone, and furnishes a firm brace for the shoulder-joint. The clavicle is absent in pterodactyls, and the shoulder-joint is formed by the shoulder-blade and a bone termed the coracoid, the two uniting to form a V, with the socket for the wing at the apex. One arm of the V rests against the backbone, the other against the front part of the breast-bone, thus forming an extremely firm brace for the wing. In birds (see Bird) the shoulder-joint is also formed by the shoulder-blade and coracoid, but the shoulder-blade runs backward, parallel with the body, the coracoid being attached to the front of the breast-bone. This forms the most important support of the wing, for while the collar-bones are present in the shape of the wishbone, they are by no means so important as is often supposed, and, as in many small birds, may be of no use at all. The collar-bones are strong, and serve to brace apart the shoulders in birds like hawks and eagles, whose vigorous movements demand an extra strong support for the wing; but in humming-birds and swifts the wishbone is feeble, although these birds have extraordinary powers of flight.

In *insects* the wings may be two or four in number, most commonly the latter, and, unlike the wings of vertebrates, they are not modified limbs, but specially developed parts believed by some to have been derived from the breathing organs of primitive aquatic forms. They are formed of thin, rather stiff membrane, braced by little ridges, termed 'nerves,' which are strongest on the front edge of the wing. This strengthening of the front margin is as absolutely essential as that the posterior portion should be flexible; any injury to this part of the wings destroys the power of flight, and flight is also impossible when the wing is made rigid. But a considerable part of the hinder portion of the wing may be removed without seriously impairing the ability to fly.

Flight-Muscles. As in insects the hard parts are outside of the muscles, the wings are attached to the exterior of the body, and are not supported by an internal skeleton. The wings of vertebrates are moved by powerful muscles attached to the breast-bone, and the depth of this portion of the skeleton is a rough measure of the muscular power used in flying. In such flightless birds as penguins, the breast-bone is deeply keeled because the wings are used for swimming and moved by the muscles employed by other birds in flight. Among dragon-flies the muscles are fastened directly to the base of the wings, much as in vertebrates; but in insects generally the wings are not only moved by these direct muscles, but by powerful cross-muscles, which alter the curvature of the body and by so doing raise or depress the wings.

Modes of Flight. Broadly speaking, there are two modes of flight: (1) By repeated strokes of the wings; and (2) by gliding or sailing with outstretched, almost motionless, wings; but almost every intermediate condition is to be met with. The humming-bird and albatross represent the extremes of these methods; the former moves the wings so rapidly that they are invisible, while the latter sails for long periods without a movement of its pinions. The common chimney-swift is an excellent and familiar example of an intermediate state, vibrating its wings rapidly for a few strokes and then sailing.

The first method calls for a rather short and strongly built wing and large muscles; the second for a long wing and very little expenditure of muscular energy. The wings of the albatross are from 10 to 12 feet from tip to tip, and but nine inches broad, while the muscular power of the bird is so slight that it cannot rise from the water when gorged with food. It is of interest to note that the long, narrow wing is the one which, in theory as well as in practice, is best for sailing. Contrary to what might be supposed, the support of the wing is stronger in sailing birds than in others, reaching the maximum of strength in the frigate-bird, which, though noted for its power of long-sustained flight, has very small muscles. Birds of prey exhibit a combination of the two methods of flapping and sailing, and their wing-muscles are so powerful that they are able to carry away birds as heavy as themselves.

Birds that sail must obtain their initial velocity either by darting from some elevated place, by strokes of the wings, or by strokes of the wings aided by the wind, which they face when taking flight. (See below.) The albatross cannot rise from the deck of a vessel, and when taking wing on a calm day is obliged to flap along the water for a considerable distance. Once in the air the sailing bird utilizes to the utmost the momentum first acquired, and it is probable that the ever-changing force and direction of the wind is an important factor in sailing, the bird instinctively making use of every variation in the currents of air. As bearing on this it may be said that the system of muscles by which the movements of the outer parts of the wing are controlled is much more complex in sailing than in flapping birds.

Insects resemble humming-birds in the comparative lack of flexibility in their wings and mode of flight, while, owing to the small size of the wings and the slight contractions of the muscles that drive them, they are moved with almost inconceivable rapidity, the smaller the wing the more frequent being its strokes. Thus, while the large moths and butterflies flutter slowly, the wings of the house-fly, according to Marey, vibrate 330 times per second.

Bats, the only group of flying mammals, also fly entirely by means of wing-strokes, the frequency of the stroke being in an inverse ratio to the size of the species, the small bats fluttering, the large fruit-bats flapping their wings somewhat like a crow. The length and narrowness of the wings of pterodactyls, and the small surface for muscular attachment, indicate that these creatures sailed or flew with infrequent wing-strokes, after the fashion of a chimney-swift.

Relation of Size and Weight to Flight. It is an interesting question whether or not the animals that fly represent the limits of size and weight attainable by living creatures. The albatross, condor, swan, and pterodactyl represent the maximum of weight, but these range only from 15 to 30 pounds, and the spread of wings is but 7 feet in the swan, 8 to 10 feet in the condor, and 10 to 14 feet in the albatross. The very largest examples of pterodactyls had a spread of wing of 20 feet; but owing to the small size of the body and wonderful lightness of the skeleton, their weight at the outside was not more than 30 pounds. These reptiles, with their great expanse of wing, offer one of the exceptions to the general rule that the wing area per pound is proportionally less in large flying animals than in small, a seeming anomaly which, though imperfectly understood, is partly based on the fact that the great sweep of a large wing makes it much more effective than one of small dimensions. Very erroneous ideas prevail both as to the power of the muscles and the speed attained by birds. Marey long ago showed that the contractile power of the muscular fibres was certainly no greater in birds than in mammals, and observation has shown that even ducks, which fly very rapidly, seldom attain a greater speed than 35 to 40 miles an hour, although under favorable conditions some species may exceed this.

It has long been evident that if the problem of artificial flight is solved it will be by a system of planes imitating the methods employed in sailing flight, and all recent experiments have been conducted on this line. But while there have been many different theories to explain the principle of soaring or sailing, many of them fanciful and some based on misinterpretations of facts, the subject is far from being understood, although the researches of Langley, Maxim, Chanute, and Lilienthal have thrown much light upon it.

Flight of Birds. So long ago as 1680 an Italian, Borelli, propounded a theory of flight which in its essential feature holds good to-day. Noting that all wings are rigid in front, flexible behind, he considered that as the wings were raised and lowered they formed obliquely directed planes alternately facing backward and forward, by which the bird was, so to speak, wedged through the air. More recently Professor Pettigrew, of England, and Professor Marey, of France, have studied the flight of birds, the latter in particular devoting much attention to the subject, and devising very elaborate experiments to ascertain the action of the wings. Professor Marey was able to photograph the position of the wing at different phases of the stroke. This shows that the wing is not merely moved up and down, but that it has a variety of movements by which, combined with the resistance of the air, the wing assumes a somewhat twisted shape. According to Marey, the movements of the wing in a pigeon are briefly as follows:

At the commencement of the downward stroke the wings are spread to the utmost, and brought downward and forward until their tips are in advance of the head. At the beginning of flight the downward movement is so great that the wing-tips touch, while on their recovery they strike above the bird's back, producing the clapping sound so noticeable when pigeons take flight. The wing is now raised rapidly and at the same time flexed at the wrist-joint, to be again straightened as the wings are raised to their full extent. In performing these motions the long axis of the wing describes an ellipse, being carried first forward and downward, then backward and upward. During the downward stroke the front edge of the wing looks downward, the under surface of the wing being directed backward, these positions being exactly reversed during the upward stroke. It will be seen that by this disposition the wing has a propelling force during the downward stroke, while during the recovery, or upward movement, it acts as an inclined plane to raise the bird. There is, nevertheless, a rising and falling of the body, more or less pronounced, at every stroke, so that the forward path of the bird is not a perfectly straight line. Professor Pettigrew insists that during the downward stroke of the wing its under surface is directed *forward*, and that the long axis of the wing describes a figure ∞ at each stroke, and that the wing, by this screw-like action, acts much after the fashion of a propeller; but the results obtained by photography do not seem to bear out this theory.

The method of sailing flight is less easily explained, because the results obtained seem out of all proportion to the force expended. Having obtained its initial velocity, the bird is held to avail itself of every increase or upward eddy of the wind to rise, although in doing this onward movement is checked. The bird then sails forward and downward, to again rise and repeat these movements. Soaring, or ascending in spirals, is performed by this method, aided by upward currents of air. The difficulty in the way of this theory is that birds progress for long distances almost horizontally, while we cannot suppose that convenient upward currents are everywhere to be met with. But the experiments of Lilienthal have shown how little force is necessary for gliding flight, since by jumping from an elevation he was able, with the aid of wings of his invention, to sail for upward of a quarter of a mile. For power of long-distance flight, see Migration.

Bibliography. Pettigrew, *Animal Locomotion* (London, 1873); Marey, *Animal Mechanics* (London, 1874); Marey, *Le vol. Physiologie du mouvement du vol. des oiseaux* (Paris, 1890); Newton, article "Flight," in *Dictionary of Birds* (London, 1893-96); Headley, *The Structure and Life of Birds* (London, 1895).

FLIGHT INTO EGYPT, The. A painting by Murillo, representing the Virgin riding on an ass, and contemplating the sleeping Child. It is in the possession of the Duchesse de Galliera, Paris.

FLIGHTLESS BIRDS. Certain groups and species of birds lack the power of flight. Such birds fall into two categories: (1) ratite birds; and (2) groups or isolated species among carinate birds distinguished from their fellows by this disability. The ratite birds (see Ratitæ) form a primary group, comprising the moa, epiornis, and other fossil or extinct forms, and the existing kiwis (Apteryx), ostriches, cassowaries, etc. They are distinguished as a class by the fact that the median line of the breastbone is not produced into an elevated ridge or 'keel' as is the case with all other, or carinate, birds, where this keel is required to give attachment to the great pectoral muscles that move the wings. It is believed, however, that the ratite birds are a modified, not to say degenerate offshoot from the primitive carinate stock, originating at a very early day in adaptation to life upon open plains, where, from lack of enemies, or for some other reason, the use of the wings was less advantageous than ability in other directions, and consequently disappeared. Such birds are now denizens almost exclusively of plains and deserts. See Cassowary; Kiwi; Moa; Ostrich; and similar titles.

In the case of the other category, various circumstances seem to have brought about the flightless condition. In some, indeed, it is only partial, while others have completely lost the use of their wings for flying. Among the latter are the penguins, in which the wings have been converted into paddles, an adaptation to the requirements of a pelagic bird whose prey is caught under water; the same was true of the extinct great auk (see Garefowl); and in the Mesozoic hesperornis the loss extended to a complete disappearance of any external wings whatever. Another striking example is furnished by the extinct dodo and solitaire (qq.v.) of Mauritius and Rodriguez islands, whose wings had become small and totally useless, owing, it is believed, to the fact that, through innumerable generations, these birds had found no advantage in their possession, but rather a disadvantage in the prevailing high winds which often made it unsafe to fly much above the trees lest the birds be blown to sea. A fact parallel with this is the wingless condition on these islands of various insects belonging to classes that are elsewhere in full possession and use of their wings. A precisely similar instance, also, is found in a rail isolated on the island of Tristan d'Acunha, which has lost the power of flight, and whose wings have nearly disappeared. (See Rail.) Another curious instance of the flightless condition is afforded by an extinct goose (*Cremiornis calcitrans*) of New Zealand, remains of which are found in that country, but the epoch to which they should be referred is uncertain. The duck Nesonetta, confined to the Auckland Islands, near New Zealand, is a similar case. Harris's cormorant is another of the several further examples which might be cited of the effect of isolation (q.v.) on islands as affecting flight. It is an inhabitant of the Galapagos Islands.

FLIM'NAP. The premier of the Lilliputians in Swift's *Gulliver's Travels.* The character was intended by the author as a caricature of Sir Robert Walpole.

FLINCK, Govaert (1615-60). A Dutch genre and portrait painter, born in Cleves, January 25, 1615. He was a pupil of Lambert Jacobsz of Leeuwarden, also of Rembrandt, who was a friend as well as master; and at one period of his life Flinck's paintings and Rembrandt's resembled each other so closely that the critics found it difficult to distinguish them. Establishing a studio at Amsterdam in 1636, he became well known as a portrait painter and received many official commissions. The arrangement of the compositions is good; the treatment is broad with warmth of color in the flesh tones; the pose of the heads natural, full of animation, with a feeling of tenderness. In the later years of his life, he was influenced by the Flemish schools, also by Murillo. He died in Amsterdam February 2, 1560, leaving a large collection of antiquities, drawings, and engravings valued at 12,000 florins. The following paintings are among his best-known works: "Isaac Blessing Jacob" (1638), in the Museum of Amsterdam; the "Regents" (1642), Hotel de Ville, Amsterdam; the "Archers" (1648), Museum of Amsterdam; "Man and His Sister" (1646), Rotterdam; "Expulsion of Hagar," Berlin Museum; "Guard Room," Munich. Consult Havard, *L'art et les artistes hollandais*, ii. (Paris, 1880).

FLIN'DERS, Matthew (1774-1814). An English navigator and hydrographer, born at Donington, Lincolnshire. He studied geometry and navigation by himself, and in 1790 entered the Royal Navy as a midshipman. After active service in European waters and in the West Indies, he was attached in 1795 to the *Reliance.* with which he sailed to Australia. There he spent five years, devoting the greater part of his time to geographical discoveries and coast surveys. Flinders circumnavigated Tasmania in a small sloop, and made exact geographical observations and calculations regarding the island. He was promoted a lieutenant in 1798, and on his return to England was placed in command of the ship *Investigator,* with instructions to return to New Holland, as Australia was then called, and complete a systematic survey of its coast. Flinders sailed from England in July, 1801, and beginning with Cape Leeuwin on the southwest coast, he spent the following two years in tracing and mapping the coast-line east and northward as far as the Gulf of Carpentaria on the north coast. Being unable to complete the survey of the west coast, owing to the unseaworthiness of the *Investigator,* he started to return to England in a small ship, but having unfortunately stopped at Mauritius on his way, he was detained there a prisoner for six and a half years. Released at length, he returned to England broken in health, and completed the account of his voyage and discoveries only a short time before his death. He was promoted to the grade of captain in 1810. Flinders ranks as one of the world's greatest hydrographers, and his survey of the Australian coast still forms the basis for the modern charts. He was also the first successfully to investigate the errors of the compass due to the attraction of iron in a ship. His account of his voyage was published in the year of his death (1814), under the title *A Voyage to Terra Australis* (2 vols. with atlas). Consult also a "Memoir" in the *Naval Chronicle,* vol. xxxii. (London, 1815).

FLINDER'SIA (Neo-Lat., named in honor of Capt. Matthew *Flinders*). A genus of trees of the order Meliaceæ. One species, *Flindersia australis,* yields a heavy, hard, and often dark timber that is inferior to mahogany. It is much used in Australia, and is there called Elindosa ash or crow's ash. The tree is of rather rapid growth, specimens 100 to 150 feet in height and 4 to 6 feet in diameter being reported. *Flindersia Oxleyana,* a tree 150 feet high, furnishes a light yellow wood, and is considered one of the finest Australian hardwoods for cabinet work. A yellow dyestuff is also prepared from this species. *Flindersia maculosa,* called leopard-tree, is a smaller species, the timber of which is used for shingles, barrel-staves, etc. A gum that exudes from this tree in considerable quantity resembles gum arabic and makes good mucilage. *Flindersia australis* is said to be a valuable street tree in the tropics. Its fruits are rough, and according to Maiden are used as rasps in preparing roots, etc., for food.

FLINDERS LAND (named in honor of Capt. Matthew *Flinders*). An early name given to what is now South Australia (q.v.).

FLINDO′SA. See Flindersia.

FLING, Highland. See Highland Fling.

FLINS DES OLIVIERS, flăn dȧ zô′lê′vyȧ′, Charles Louis Marie Emmanuel Carbon de (1757-1806). A French poet, born in Reims. He was King's officer for some time at Vervins, and wrote there a poem *Voltaire* (1779). Under the pseudonym Louis Emmanuel he wrote *Les voyages de l'opinion dans les quatres parties du monde* (1798-1800). His other works include: *Les amours avec un essai sur la poésie érotique* (1780); *Poèmes et discours en vers* (1782); *Plan d'un cours de littérature* (1784); and the comedies *La jeune hôtesse* (1792), which was imitated from Goldoni's *Locandiera; Le mari directeur* (1791); and the cleverly planned *Le Réveil d'Epiménide* (1790).

FLINT (AS. *flint,* OHG. *flins,* dialectic Ger. *Flins;* probably connected with Gk. πλίνθος, *plinthos,* brick). A massive variety of quartz somewhat similar to chalcedony, but usually of dark colors, as gray and brown. It is generally found in the form of nodules in deposits of chalk, especially in the chalk cliffs of England. It is of wide occurrence, and is found chiefly in the counties of Kent, Norfolk, and Suffolk, England, where it was formerly used as a building material, and in Cretaceous limestones of the United States. Microscopic examination of flint shows that it contains spicules of sponges and frustules of diatoms, which have suggested that these served as a nucleus around which the silica was deposited from solution. According to Pliny, Clias was the first to strike fire with flint, and its use for sharp weapons and cutting instruments such as axes, arrowheads, knives, etc., is evident from its discovery among the earliest prehistoric relics. The readiness with which it produces fire when struck with steel leads to its extensive use for igniting tinder and its employment as gun-flints. But these uses have been superseded by matches and percussion caps, and its principal application at present is as an ingredient of fine pottery, for which purpose it is calcined, thrown into cold water, and then finely powdered. Consult: Evans, *Ancient Stone Implements, Weapons, and Ornaments of Great Britain* (London, 1872); Stevens, *Flint Chips* (London, 1870).

FLINT. The capital of Flintshire, Wales; a seaport and municipal borough since 1284; on the estuary of the Dee, 13 miles southwest of Liverpool (Map: Wales, C 3). Only vessels of small draught can enter its port. It is a smoky little town, possessing lead and coal mines, copper and chemical works. Population, in 1891, 5250; in 1901, 4600. Roman relics and traces of Roman lead-smelting works have been found. Flint was made a borough by Edward I., who built the castle which still exists, but in a ruined state. Richard II. on August 19, 1399, surrendered to Bolingbroke at Flint Castle, and in 1643 the fortress was captured by the Parliamentarians, who dismantled it four years later.

FLINT. A city and the county-seat of Genesee County, Mich., 68 miles northwest of Detroit on Flint River, and on the Père Marquette and the Chicago and Grand Trunk railroads (Map: Michigan, K 6). It is the seat of the State institution for the deaf and dumb, and among other features are Oak Grove Hospital, a private retreat for the insane, a fine high school building, a public library, and the grounds of the County Agricultural Society. The city has large lumber interests, and several saw and planing mills, besides extensive carriage and wagon works, flouring-mills, and grain-elevators, iron-works, breweries, cigar-factories, woolen-mills, brick and tile works, etc. Flint was settled in 1820 and in 1855 was chartered as a city. Population, in 1890, 9803; in 1900, 13,103.

FLINT, Austin (1812-86). An American physician, born at Petersham, Mass. He was educated at Amherst and Harvard, and graduated at the latter in 1833. After practicing in Boston and Northampton, he removed to Buffalo, N. Y., in 1836. He was appointed professor of the institutes and practice of medicine in Rush Medical College, Chicago; resigned after one year, in 1846, and established the *Buffalo Medical Journal.* With White and Hamilton he founded the Buffalo Medical College in 1847, where he was professor of the principles and practice of medicine for six years. He was afterwards professor of the theory and practice of medicine in the University of Louisville, Ky., from 1852 to 1856. He was then called to the chair of pathology and clinical medicine at Buffalo. From 1858 to 1861 he was professor of clinical medicine in the School of Medicine at New Orleans. In 1859 he removed to New York, and in 1861 was appointed visiting physician to Bellevue Hospital; from 1861 to his death, in 1886, he was professor of the principles and practice of medicine in Bellevue Hospital Medical College (consolidated with the medical department of New York University in 1898), and from 1861 to 1868 he was professor of pathology and practical medicine in Long Island College Hospital. He was president of the New York Academy of Medicine from 1872 to 1885. His published works include: *On Continued Fever* (1852); *Chronic Pleurisy* (1853); *On Dysentery* (1853); *Physical Exploration in the Diagnosis of Diseases of the Respiratory Organs* (1856; revised 2d ed. 1868); *Diseases of the Heart* (1859; 2d ed. 1870); *Principles and Practice of Medicine* (1866; revised 5th ed. 1884); *Medical Essays on Conservative Medicine and Kindred Topics* (1874); *Clinical Medicine* (1879); *On Phthisis* (1883); *Manual of Auscultation and Percussion* (revised 3d ed. 1883). Consult his biography, by Carpenter (New York, 1886).

FLINT, Austin, Jr. (1836—). An American physician, born at Northampton, Mass.; son of Austin Flint (q.v.). He attended medical lectures at the University of Louisville from 1854 to 1856, and in 1856 and 1857 at Jefferson Medical College, Philadelphia. From 1857 to 1859 he was editor of the *Buffalo Medical Journal,* surgeon of Buffalo City Hospital, and professor of physiology and microscopical anatomy in the University of Buffalo. In 1859 he removed to New York with his father, and was appointed professor of physiology in New York Medical College. He was professor of physiology in the New Orleans Medical College in 1860, and studied in Europe in 1860 and 1861. He was professor of physiology and microscopic anatomy in Bellevue Hospital Medical College, New York City, from 1861 till this institution was consolidated with the medical department of New York University in 1898, when he was appointed professor of physiology in Cornell University Medical College. He was, in 1874, Surgeon-General of New York State. He carried out extensive experimental investigations in human physiology, and made several important discoveries. He assisted in establishing the glycogenic function of the liver; showed that one of the functions of the liver is to separate from the blood the cholesterin, which is a product of the nervous system, and which, becoming a constituent of the bile, is afterwards converted into what he named 'stercorin,' the odorous principle of the fæces. His principal works are: *The Physiology of Man* (5 vols., 1866-74; 4th ed. 1888); *Chemical Examinations of Urine in Diseases* (5th ed. 1879); *Effects of Severe and Protracted Muscular Exercises* (1871); *Source of Muscular Power* (1878); *Text-book of Human Physiology* (1875); *Experiments Regarding a New Function of the Liver, Separating the Cholesterin of the Blood and Eliminating it as Stercorin* (1862); *The Physiology of the Nervous System* (1872); *Mechanism of Reflex Nervous Action in Normal Respiration* (1874); *The Treatment of Diabetes Mellitus* (1884); *Manual of Chemical Examination of the Urine in Disease* (1893); *Stercorin and Cholesterœmia* (1897).

FLINT, Robert (1838—). A Scotch theologian, born in Dumfriesshire. He studied at Glasgow University, and from 1859 to 1864 was pastor successively of churches at Aberdeen and Kilconquhar. From 1864 to 1876 he was professor of moral philosophy and political economy at Saint Andrew's University, and in the latter year was appointed professor of divinity in Edinburgh University. He was Stone lecturer at Princeton University in 1880, and Croall lecturer at Edinburgh in 1887-88, and a foreign correspondent of the French Institute. His works number the following: *Christ's Kingdom on Earth* (1865); *Philosophy of History in Europe* (1874); *Theism* (1877); *Historical Philosophy in France* (1894); and *Sermons and Addresses* (1899).

FLINT, Solomon. A wealthy miser in Foote's play *The Maid of Bath.* He was meant by the author as a caricature of a certain Walter Long, whose impertinence to Miss Linley, Sheridan's wife, was thus punished.

FLINT, Timothy (1780-1840). An American author, born at North Reading, Mass. He was a graduate of Harvard, and then a Congregational pastor until 1815, after which for ten years he was a missionary and teacher in the Mississippi Valley. Then, with little health and fortune left, he took up editorial work on the *Cincinnati Western Review,* and the *Knickerbocker Magazine* (1833), and devoted himself to the writing of his novels and other works relating to the West and Southwest. He resided at Alexandria, Va., in the winter and in New England in the summer. The best of the novels is *Francis Berrian* (1826), a tale of Mexico. His *Recollections of Ten Years Passed in the Valley of the Mississippi* (1826) was also popular, and he wrote geographies and lectures on natural history, did some translating, and furnished the London *Athenæum* with an early account or résumé of American literature. Altogether, he was an important man in his day, though long forgotten. He had a curious experience in his Massachusetts parish, somewhat recalling the fate of Gerbert, except that his ignorant parishioners thought that his chemical researches proved him to be a counterfeiter, not the Devil.

FLINT GLASS (so called because the silica used in its manufacture was first derived from *flint*). A glass whose chief constituents are the silicates of lead and potassium. It has an index of refraction of 1.62-1.63 for yellow (sodium) light, and on account of its greater dispersive power is used in combination with crown glass in the construction of achromatic prisms and lenses. See Glass; Achromatism.

FLINT IMPLEMENTS. These products of handiwork are interesting to the archæologist, the technician, and the ethnologist. The word flint must be taken to mean siliceous stones that may be flaked and fashioned into implements. For the latter word students have substituted the term artifacts. Not only tools and weapons, but ornaments, art treasures, and objects used in cults and ceremonies were made of flint from Point Barrow to Fuegia in America, and everywhere in the Old World, excepting in places that do not furnish materials. In America also from the regions of cane and hardwood flint artifacts are absent. The sources of material were the open fields, boulder beds, and exposures of undisturbed rock. The savages camped near the larger supplies, and first with hammers knocked off coarse spalls, then finer chips; finally, with pointed implements of bone, using pressure, they acquired marvelous skill in flaking the refractory materials into the desired shape. Much of the last-named process, however, was done at their homes. These ancient workshops are among the most interesting of remains, since they reveal the steps in the earliest of human industries.

Flint artifacts of the implement class pierce, cut, and abrade. They were arrow, lance, spear and harpoon heads, and bits for drills; those of the edge class were knives and saws; the abraders were scrapers for the men and skin-dressers for the women. In those regions where calcareous flint, beautiful varieties of quartz, jaspers, carnelian, and obsidian abound, the æsthetic sense was awakened and stimulated. In public museums and private collections will be found tiny arrowheads perfectly made, and immense ceremonial spear-heads over a foot long, having their surfaces finished exquisitely. Flint artifacts have given the archæologist a deal of trouble, as well as satisfaction. Coming upon boulders from which spalls have been struck, he concludes that he has found the tools of Paleolithic man, but is later satisfied that they were the refuse of workshop or quarry belonging to later savages. Again, the products and apparatus of industry are cumulative; the new never quite drives the old out of vogue. So, the occurrence of more primitive forms of flint implements at any point is no evidence of great antiquity. At the present time this class of artifacts excites unusual interest. The history of prehistoric Europe is written chiefly in them; Egypt reveals an age of chipped flint antedating all the Pharaohs; from India come products of great beauty in this art; the occurrence of rude forms in western Europe, but more especially in Quaternary deposits of America, is held to have thrown far back the life of man on the globe. The literature of the subject is vast and almost hopelessly scattered. Fortunately, the *Journal of the Anthropological Institute*, of London; the *Bulletin de la société d'anthropologie*, of Paris; the *Zeitschrift für Ethnologie*, of Berlin; the Bureau of American Ethnology and the United States Museum in Washington have each issued a catalogue with up-to-date index of the subject. The *American Anthropologist* has a bibliography in each number. Besides these institutional works, consult: Mortillet, *Le préhistorique* (Paris); Thomas, *Introduction to the Study of North American Archæology* (Cincinnati, 1898); and Fowke, *Archæological History of Ohio* (Columbus, Ohio, 1902). The older works of Evans, Baldwin, Short, are still useful. See ARCHÆOLOGY, AMERICAN.

FLINTLOCK. See SMALL ARMS.

FLINT RIVER. One of the principal rivers of Georgia, rising near Atlanta, and flowing in a general southwestern direction to the southwest corner of the State, where it joins the Chattahoochee, forming the Apalachicola (q.v.) (Map: Georgia, B 4). Its length is about 300 miles; it is navigable for small river craft as far as Albany, 150 miles above its junction with the Chattahoochee, and for heavier vessels to Bainbridge, about 50 miles. It drains an area of more than 8000 square miles.

FLINT'SHIRE. A maritime county of North Wales, bounded on the east by Cheshire and the river Dee, on the south and west by Denbighshire, and on the north by the Irish Sea (Map: Wales, C 3). Area, 256 square miles, of which one-seventh is arable. The coast, 20 miles long, is low and sandy, but on the Dee estuary, fertile. A hill-range, parallel to the Dee, runs through the length of the county, and rises in Garreg to 825 feet. Another range along the southwest border of the county rises in Moel Famma, 1845 feet. The chief rivers are the Dee, Alyn, and Clwyd. The mining industries are the most important. Coal, and ores of iron, lead, silver, copper, and zinc are the chief mineral products and exports. The chief towns are Flint, the county town; Saint Asaph, Holywell, and Hawarden. Population, in 1891, 77,300; in 1901, 81,700.

FLINT'WINCH, JEREMIAH. Servant to Mrs. Clennam in Dickens's *Little Dorrit*, who maltreats his sickly wife. His secret intrigues form an element in the plot.

FLIOMA, or **FLIAUM.** The orange rockfish (q.v.), one of the most abundant and marketable of that group of fishes in California.

FLIPPAN'TA. An intriguing lady's-maid in the service of Clarissa, in Vanbrugh's *Confederacy*.

FLITE, MISS. In Dickens's *Bleak House*, a little old woman, half crazed by the delays in her suit in Chancery.

FLIXWEED. See HEDGE-MUSTARD.

FLOATS (AS. *flota*, Icel. *floti*, OHG. *floz*, Ger. *Floss*, float, raft, from AS. *flēotan*, Icel. *flota*, OHG. *flozzan*, Ger. *flössen*, to float, launch; connected with Lith. *pluditi*, to swim, Lat. *pluere*, to rain, Gk. *πλεῖν*, *plein*, to sail, Skt. *plu*, *pru*, to swim). Very finely ground mineral phosphate, used as a fertilizer. See MANURES AND MANURING.

FLOATING BATTERY. A vessel with very feeble motive power, or none at all, but heavily gunned, and usually well protected by armor. It is designed to operate in smooth water. See ARMOR PLATE; SHIP, ARMORED.

FLOATING BEACONS. See BUOY; LIGHTHOUSE.

FLOATING HEART. See VILLARSIA.

FLOATING ISLAND. A mass of soil and organic matter floating in placid water. Floating islands are formed either by the detachment of portions of the bank in which the network of roots is sufficiently strong to withstand the action of waves, or by aggregations of driftwood in rivers and bays of tropical regions. They may be covered with herbage and trees, and animals taken by surprise while roaming upon them may go on an unexpected journey when the mass starts seaward. They have been found at long distances from land, and it is believed that they may have served to distribute organic forms over insulated regions, such as the islands of the South Pacific. Many lakes in Prussia, France, and England are noted for their floating islands; but the best examples, perhaps, are the great masses of vegetation which collect in the White Nile. These masses, called 'sudd' by the Egyptians, must be broken up at regular intervals in order to keep the waters open to navigation.

FLOATING MEADOW-GRASS. See MANNA-GRASS.

FLOATING PLANT. See HYDROPHYTE.

FLOBERGE, flô'bârzh'. The sword of Renaud de Montaubon, in the romance of that name.

FLODDEN FIELD. A plain in Northumberland, England, at the base of Flodden, the northeastern spur of the Cheviot Hills. It is famous as the battlefield where James IV. of Scotland was defeated by an English army under the Earl of Surrey, September 9, 1513. Henry VIII. of England had declared war against Scotland's ancient ally, France. James IV. sent him a peremptory demand to desist, and on Henry's refusal, gathered an army computed at 100,000 men, which, however, dwindled to 30,000 before crossing the border. James had taken up his position on Flodden Hill, when the Earl of Surrey with 32,000 men, by a skillful movement from the southeast, cut off his communications with Scotland. Observing that the English were strengthening their position, James ordered an advance at four in the afternoon, and a desperate battle ensued. The right wing of the English army, led by Sir Edmund Howard, was defeated by the left wing of the Scotch army, led by the Earls of Huntly and Home, who did not follow up their success. A furious charge of the Scottish right on the English left was repulsed with great slaughter. Meanwhile a desperate resistance was being made by the Scottish centre, where the King fought on foot among his noblemen. Surrounded by outnumbering enemies, they fought bravely until darkness came on, and the King fell pierced by an arrow and mortally wounded in the head. The hill was held during the night by the Scots; but at dawn, seeing the hopeless nature of affairs, they abandoned their position. Their loss amounted to from 8000 to 10,000 men. Besides the King, the Archbishop of Saint Andrews and twelve earls were killed, and there was scarcely a notable Scottish family without a representative among the slain. The English loss amounted to 4000. The sixth canto of Sir Walter Scott's poem "Marmion" gives a fairly accurate description of the action. Consult White, *The Battle of Flodden* (London, 1859).

FLODOARD, flô'dô'är' (894-966). A canon of Rheims, noted for his historical writings. His most important works are *Historia Ecclesiæ Remensis* (to 984), and his *Annales* (919-66). These are of the greatest importance for a knowledge of the history of the tenth century. In addition he wrote a number of works in verse. For the various editions, etc., consult: Wattenbach, *Deutschlands Geschichtsquellen*, vol. i. (6th ed. Berlin, 1893); Potthast, *Bibliotheca Historica Medii Ævi* (Berlin, 1862-68).

FLOE-RAT. The ringed seal (*Phoca hispida*), commonly observed in the Arctic-Atlantic regions lying upon the ice-floes. See Seal.

FLÖGEL, flẽ'gel, Karl Friedrich (1729-88). A German literary historian. He was born at Jauer, Silesia, studied theology at Halle, and became professor of philosophy at the Ritterakademie at Liegnitz in 1774. His reputation rests upon the work entitled *Geschichte der komischen Litteratur* (4 vols., 1784-87), in which the author, after a general preliminary treatise on the element of the humorous, reviews the history of satire among the Greeks, Romans, and the various nationalities of modern Europe; the fourth volume being devoted to a discussion of comedy, farce, and comic opera. As a continuation of the work, the author published the supplementary productions, *Geschichte des Groteskkomischen* (5th ed. 1888); *Geschichte der Hofnarren* (1789); and *Geschichte des Burlesken* (1793).

FLOGGING. The infliction of blows by a rod or scourge, especially when directed by a court or by one who is invested with public authority. In barbarous times, scourging in various forms was common to all nations; it was a common practice among European nations down to modern times. With a defective system of detention, flogging appeared to be the most effective method of dealing with petty offenses. In the army and navy of England this method of punishment existed until a comparatively recent date, being finally discontinued under a regulation of 1881; and it is only in late years that it has practically disappeared, both in Great Britain and the United States, as a means of prison discipline. In Russia flogging is still common in prisons.

In recent years there has been, in some parts of the United States, a revival of sentiment in favor of restoring flogging as a method of punishing the petty offenses of persons who find it no hardship to spend a few days in jail, e.g. habitual wife-beaters, vagrants, and the like. In Delaware flogging is still a legal form of punishment, although it is seldom resorted to. See Punishment.

FLOOD. See Inundation; Deluge.

FLOOD, Constantius (1837—). A Norwegian author, born at Porsgrund. He was a sailor for some time, and then, after a course in an agricultural school, a farmer until 1878. Then the success of some of his works and the popularity of plays he had written in 1863 and 1864 induced him to go to the capital and devote himself entirely to literature. The Storthing voted him an annual pension of a thousand crowns. He was editor of the *Ny illustreret Tidendo* (1883-86); wrote various sketches of life in the country and at sea; the novels *Ritter and Co.* (1883); *Sterke Jansen* (1886); and *Under Kaperflag* (1895); the topographical and historical studies, *Listerlandet* (last ed. 1894); *Povel June* (1876); *I Krigsaarene* (1881); and *Under Krigen 1807-14* (1892), as well as abridged translations of Prescott, Washington Irving, and Cook's voyages.

FLOOD, Henry (1732-91). A British politician and orator. He was born in Ireland, was educated at Trinity College, Dublin, and at Oxford, and in 1759 entered the Irish House of Commons. Here he soon attracted attention by his eloquence, which, combined with his high social standing, made him a leader of the popular party. He was afterwards for some time Privy Councilor for the two kingdoms, and Vice-Treasurer for Ireland, but lost the latter office (1781) because of his strong Nationalist sympathies. Disliking Grattan's Irish Bill of Rights on the ground of its not going far enough, Flood became involved in a famous quarrel with his former friend. His later career in the English House of Commons was not marked by success. He was the author of some poems and of a volume of *Speeches* (1787) that are noteworthy for their good style and logical method. Consult: Warden Flood, *Memoirs of Henry Flood* (Dublin, 1838); and Lecky, *Leaders of Public Opinion in Ireland* (New York, 1872).

FLOOD-PLAIN. A level land area on a river border, formed in times of inundation by depositions of silt, sand, or gravel, which have been eroded and transported from higher land. Owing to frequent additions of new material, the soil of flood-plains, or bottom-lands as they are popularly called, is fertile and highly productive, but often subject to damage by flood, and in northern districts by frost. Notable examples of flood-plains are the valleys of the rivers Nile, Mississippi, Ganges, Danube, and Po. See River, Valley.

FLOQUET, flô'kâ', Charles Thomas (1828-96). A French statesman and journalist, born at Saint-Jean-de-Luz in Basses-Pyrénées. He was educated at Paris, and took part in the Revolution of 1848. In the organization of the Government of National Defense in 1870 and during the subsequent siege of Paris, Floquet was extraordinarily active, and was later chosen as representative to the National Assembly by the Department of the Seine. During the Commune (q.v.) Floquet attempted to mediate between the revolutionary leaders and the Versailles Government, but was so radical in his sentiments that he was arrested in 1871, and suffered a month's imprisonment at Paris. In 1872 he appeared in public life as a radical Republican, and in 1876 entered the Chamber of Deputies, voting always with the Extreme Left. The same year he established the Radical journal *Le Peuple.* He was made Prefect of the Seine in 1882, but reëntered the Chamber soon after, and from 1885 to 1888, when he became Prime Minister, was president of that body. The height of his popularity was reached in 1888 after the famous duel in which he wounded General Boulanger (q.v.) in the throat. In February, 1889, on the defeat of his projected constitutional amendment, he resigned the premiership. The Panama disclosures in 1892-93 implicated Floquet and injured his political standing, although he was elected to the Senate in 1894. He died January 18, 1896. Consult Proth, *Célébrités contemporaines*, vol. ii. (Paris, 1883).

FLOOR (AS., Icel. *flōr*, Ger. *Flur*, Ir., Gael. *lār*, Corn. *lor*, Welsh *llawr*, Bret. *leur;* ultimately connected with OPruss. *plonis*, barn-floor, Lith. *plonas*, flat, Lat. *planus*, level, *Gk.* *πλάξ*, *plax*, level surface). The horizontal partition between the stories of a building; the upper part of which forms the floor of the apartments above, and the lower portion the ceiling of those below. The ground floor of barns and such structures is but slightly raised above the ground level, thus being distinguished from pavements, which are laid solidly on the ground. In its narrowest sense, it is merely the lower visible surface of any interior or even of a bridge, a platform, balcony, etc., without reference to the supporting structure.

Floors are variously constructed, according to their dimensions, to the weight they have to sustain, and to the character of the buildings. The supporting structure may be a vault of masonry, a combination of iron beams with brick arches or other non-combustible filling, or a series of parallel wooden beams called *joists.* The last is the common construction, except for important and fireproof buildings. *Single-joisted* floors are the simplest and most cheaply constructed, and are used for ordinary buildings, where the distance between the bearings does not exceed 20, or, at most, 24 feet.

Joists are beams laid edge upward, and resting at their ends upon wall-plates built into the walls. Their width should not be less than two inches, for if narrower, they would be liable to split with the nailing of the flooring-boards. They are placed edge upward, in order to economize timber, as the strength of a beam to bear a transverse strain varies simply with the breadth and with the square of the depth. When a deep and long joist is used, there is danger of its twisting or turning over; this is prevented by *strutting*, or *cross-bracing*, that is, nailing crosspieces of wood between them, or, less effectually, by driving pieces of planking between them. Strutting is required when the length of the joists exceeds eight feet. The laths for the ceiling of the room below are nailed to the bottom of the joists. In good, substantial work, the distance between the joists, from centre to centre, is about twelve inches, but this is usually exceeded in cheaply built houses, where the normal distance is sixteen inches.

Double-joisted floors are constructed by laying strong timbers, called *binding-joists*, from wall to wall, at a distance of about six feet apart, and a double set of joists, one above for the floor, and one below for the ceiling, are laid across these, and notched down upon them. These latter, when thus placed, are called *bridging-joists*, as they bridge over the interval between the larger binding-joists. This is adopted when a more perfect ceiling, free from cracks produced by the yielding of the floor, is required, or where there is a difficulty in obtaining a sufficient amount of long timber for single-joisting the whole of the floor. The term *double floor* is used of this method as well as of a flooring made of two thicknesses of board or plank, the lower of rough material laid diagonally, the upper of choicer material.

The *framed floor* is one degree more complex than the double-joisted. Binding and bridging joists are used in the framed floor, but the binding-joists cease to be the primary support, as for this purpose strong balks of timbers, called *girders*, are used. They are laid across, at distances of from eight to ten feet, and the binding-joists are framed into them by a *tusk-tenon* joint. The bridging-joists are notched to these in the same manner as for double-joisted floors. A *bay* is the general name for the space between girders; if between a girder and a wall, it is called a *tail bay;* or between two girders, a *case bay;* and the work between is described as a *bay of joisting.*

When the space to be spanned is too great for a simple wood girder, trussed or built-up wooden girders or iron girders are used; the latter have, of late, come into extensive use, even where simple wood girders are sufficient. See GIRDER.

With a given quantity of lumber and a moderate space, the single-joisted floor is the strongest of any. One of its disadvantages is the free communication of sound to the apartment below, unless some additional means of obstructing the sound be adopted. This is partly obviated by the use between the boards of the double flooring above of felting, heavy building-paper, or the like.

The flooring-boards are usually nailed to the joists, and vary from 1 to 1¼ inches in thickness; for common floors they are from 4 to 8 inches wide, but for better floors a width of only 2 to 4 inches is used. The advantage of the narrow boards is that the shrinkage and warping have not so much effect on the spaces between. In all but the commonest houses, the floor is blind-nailed. This refers to the ordinary deal flooring used in modern American domestic buildings. In old English and Continental houses the flooring, instead of being of thin and narrow matched boards, was of wider heavy plank. The facing of the floor in many old mansions is formed of small pieces of oak carefully inlaid. (See PARQUETRY. For other kinds of inlaid fancy floors, see MOSAIC; ENCAUSTIC TILES; and CONCRETE.) In the old palaces and houses of Italy and many buildings in France and Germany, bricks are often found in place of wood for all floors, occasionally replaced by decorative tiles. Such heavy flooring was natural in the Middle Ages, when stone-vaulted rooms were frequent and even concrete floors were used. In fireproof buildings the beams and girders are usually of iron or steel between which are flat arches or brick terra cotta, or concrete slabs on iron plates, bars, or wire netting. See FIREPROOF CONSTRUCTION.

FLOOR-CLOTH. A covering for a floor, used either as a substitute for carpets, or laid over them to protect them. See LINOLEUM; OIL-CLOTH; and KAMPTULICON.

FLOR, flōr, ROGER DE (c.1262-1305). A Catalan chief, of German descent. He was born at Brindisi, and at the age of fifteen entered the service of the Templars, and later joined their Order. He fought in Palestine, but was accused of robbery at the capture of Acre by the Mohammedans in 1291 and had to escape. He went to Sicily and became vice-admiral of King Frederick's fleet; in 1303 a band of free lances chose him their chief, and he led them to Constantinople, where they served Andronicus Palæologus against the Turks. (See CATALAN GRAND COMPANY.) Roger was married to the Byzantine Emperor's niece; defeated two Turkish armies, but was recalled by the Emperor and made Cæsar, but received no money for his soldiers. When they turned to plunder, the Emperor's son Michael, who was associated with his father, invited Roger to Adrianople, and there assassinated him at the close of a banquet.

FLO'RA (Lat., from *flos*, flower). Among the Romans, the name of the goddess of flowers, and of the spring, and identified by the poets with the Greek *Chloris*. In Rome she had a temple on the Quirinal and another in the vicinity of the Circus Maximus. The worship of Flora was one of the oldest manifestations of the Roman religious feeling, and is affirmed to have been introduced by Numa. The *floralia*, or festivals in honor of the goddess, were first instituted B.C. 238, and were celebrated from April 28th to May 1st, with much licentious merriment. On coins, Flora is represented with a crown of flowers.

FLORA. The aggregate of plants growing spontaneously in a country or district, or a publication which deals with them, as the flora of Illinois, or the flora of a pond. In the latter example the term is in reality ecological, and is the equivalent of plant society, but in most cases the term flora has no ecological significance. See DISTRIBUTION OF PLANTS; ECOLOGY; TAXONOMY.

FLORA. A painting by Titian, representing a woman, partially draped, holding flowers. It hangs in the Uffizi Gallery at Florence.

FLORA'LIA. A Roman festival and games. See FLORA.

FLORA McFLIMSEY. See NOTHING TO WEAR.

FLORDELISE, or **FLORDELIS,** flôr'de-lês. The wife of Brandimart in the *Orlando* of both Boiardo and Ariosto, who, after he dies, spends the rest of her life near the place of his burial.

FLORDESPINA, flôr'då-spē'nå, or **FLORDESPINE,** flôr'de-spīn. A princess who takes the warlike Bradamant for a man, because of her armor, and falls in love with her, in the *Orlando* of both Boiardo and Ariosto.

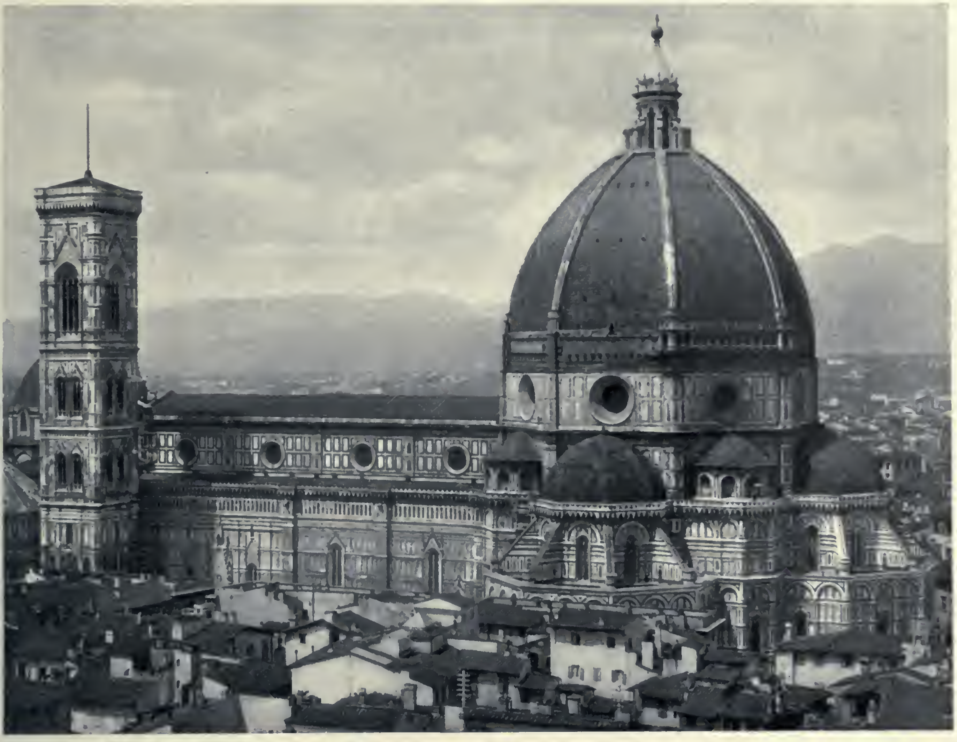
FLORÉAL, flô'rå'ål' (from Lat. *floreus*, relating to flowers, from *flos*, flower). The eighth month in the French Republican calendar. It extended from April 20th to May 19th in the years I.-VII., and from April 21st to May 20th in the years VIII.-XIII. See CALENDAR.

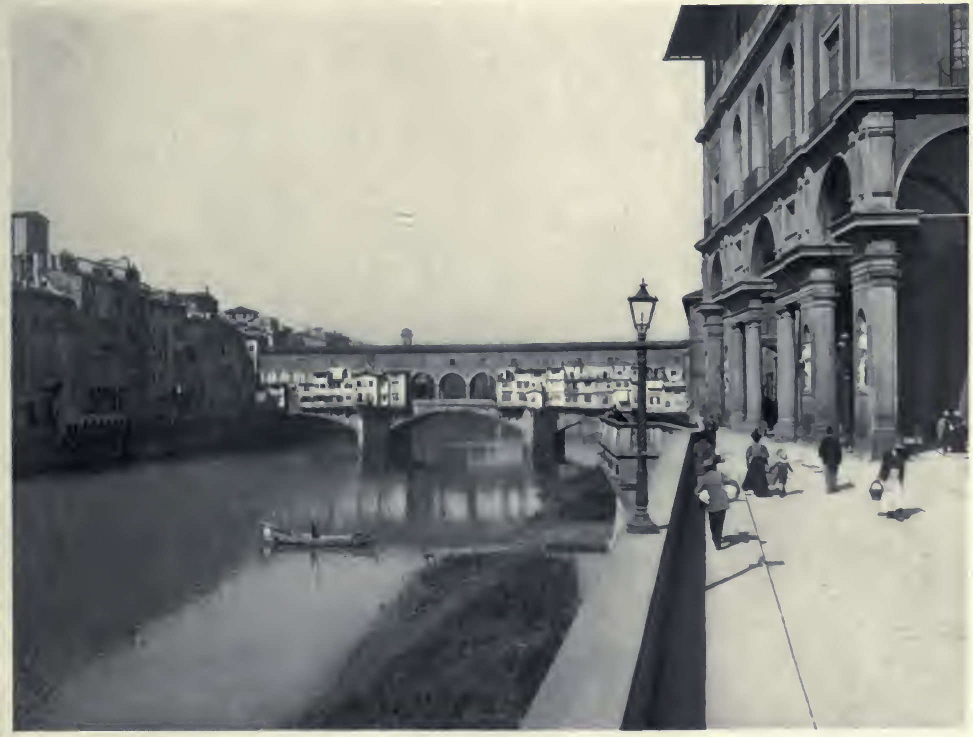
FLORE ET BLANCHEFLEUR, flôr å blâNsh'flẽr'. The title of an old French romance, so called from the names of the lovers—Flore, a Christian knight, and Blanchefleur, a Saracen slave. The story is used in Boccaccio's *Il Filocopo*, by Chaucer in the Franklin's tale, in *Canterbury Tales*, and appears in a number of English versions.

FLOR'ENCE (It. *Firenze*, Lat. *Florentia*, from *florere*, to bloom, from *flos*, flower). A city of Italy, formerly capital of the Grand Duchy of Tuscany, now capital of the Province of Florence, situated on the Arno, in latitude 43° 46' N. and longitude 11° 15' E., 60 miles east of Leghorn and 140 miles northwest of Rome (Map: Italy, F 4). It lies on the plain at the foot of the Apennines, about 123 feet above the level of the sea, at the head of navigation on the Arno. The river divides the city into two unequal parts, the chief of which stands on the northern bank. The stream is spanned by four ancient stone bridges and by two modern iron structures, the latter at opposite ends of the city, connecting a series of modern boulevards called *viali*, which since 1873 have replaced the ancient walls, 6 miles in circuit, which surrounded Florence. Dating from the Roman period, the city had three successive wall circuits, all confined to the right bank: (1) Roman walls; (2) mediæval walls, of the thirteenth century; (3) Renaissance walls, of the sixteenth century, of which there are interesting remains. Fine roads lead from the preserved gateways to thickly peopled suburbs, encircled by sloping hills, and studded with picturesque villas, fruitful vineyards, and gardens. Horse-cars and steam and electric tramways give access to the various points of interest. The modern extension of the city dates from the establishment here, in 1865, of the seat of the Italian Government; it, however, received a serious check in 1870 by the transfer of the capital to Rome.

There is more than the usual contrast between the ancient and modern parts, because so much of the ancient has been preserved. Several of the city gates of the thirteenth and fourteenth centuries remain, massive and decorated with religious images; the Ponte Vecchio (1362), with its rows of goldsmith shops, is one of the few survivals in Europe of the mediæval custom of giving up the bridges in the centre of a city to the trades. The other stone bridges are the Ponte alle Grazia (1237), Ponte alla Caraja (1559), and the Ponte Santa Trinità, built by Ammanati in 1570. Most of the heart of the old city remains intact, being surrounded by the new quarters on both banks of the Arno. The Piazza dell' Indipendanza and the Piazza d'Azeglio are the most prominent of the new squares; while the chief of the old are the squares of the cathedral; of the Signoria, with its historic buildings, where the people always assembled; of the Mercato Vecchio, where they traded; of Santa Maria Novella, with its two marble obelisks, where they held their festivals; of Santa Croce, with the statue of Dante; and of the Annunziata, with the equestrian statue of Ferdinand I., by Giovanni da Bologna, and two fountains by Tacca.

Among its numerous striking architectural features are the interesting eleventh-century basilical churches of Fiesole and San Miniato, which show how important those suburbs were at that





FLORENCE

CATHEDRAL OF SANTA MARIA DEL FIORE (UPPER)

PONTE VECCHIO AND PORTICO OF THE UFFIZI GALLERY (LOWER)

early date; and in the city itself, the old eleventh-century cathedral—now the Santi Apostoli—and the baptistery of San Giovanni belong to the early mediæval or Romanesque period, although the baptistery was covered with its many-colored marble facing, and its apse and dome were filled with remarkable mosaics during the thirteenth century. At the same time, part of the Bargello, or Palace of the Podestà, the oldest of civic monuments, was built (1255), and with the last decades of the thirteenth century came the grand monuments on a larger scale corresponding to the city's growth. These are the Cathedral or Duomo of Santa Maria del Fiore, commenced in 1298; the Church of Santa Croce, the Florentine Pantheon and Metropolis of the Franciscans; the Church of Santa Maria Novella, the central seat of the Dominicans (1278); the Ponte Vecchio; the grain market of Or San Michele (1284), chief of the Florentine guild buildings; and the Palazzo Vecchio, or della Signoria (1298), the administrative centre of the Republic. This series was completed by the Loggia dei Lanzi, built in 1374 in the great square—a triple open portico, the most colossal and beautiful in Italy; and especially by Giotto's Tower, the campanile of the cathedral, begun in 1334. The Duomo itself continued to be the centre of Florentine artistic endeavor throughout the fourteenth century, Arnolfo di Cambio's plan being enlarged by Talenti, and the magnificent epoch-making dome being added by Brunelleschi in the following century. This monument of superb proportions is 556 feet long; the width of the transepts is 306, of the nave and aisles 128 feet; the height of the aisles is 96½ feet, of the nave 153 feet, and of the dome to the summit of the cross 387 feet. The dome is the largest in the world, and served as Michelangelo's model for the dome of Saint Peter's at Rome, the only ecclesiastical structure superior in architectural grandeur to the Florentine church. The group of cathedral, tower, and baptistery is imposing; the beginnings of Florentine painting are illustrated in the baptistery mosaics and in Lucca della Robbia's singing angels in the cathedral; the highest achievement of Florentine sculpture in the baptistery's bronze gates by Pisana and Ghiberti; the most ambitious architectural effort in the cathedral dome; and the perfection of the decorative system in the exterior marble facing of the baptistery. The heart of mediæval Florence, however, is at Santa Maria Novella and the Ponte Vecchio, and of Renaissance Florence at San Marco in the Mercato Nuovo and in the Pitti and Riccardi palaces, while some of its greatest memories are enshrined at Santa Croce, which is filled with the monuments of great men—Dante, Galileo, Machiavelli, Michelangelo, and others; and in San Lorenzo, which contains several of the masterpieces of Michelangelo, and the famous tombs of the Medici. Unlike some Italian cities, the Florentine churches retain a large portion of their works of art. The "Paradiso" by Orcagna, and the earlier frescoes of the Cappella degli Spagnuoli at Santa Maria Novella, are perhaps the finest works of Italian painting between Giotto and the Renaissance. Giotto himself is represented at Santa Croce by frescoes, and the artistic personality of Fra Angelico is nowhere else shown as in his frescoes at San Marco, where he lived. The Florentine Renaissance at the beginning and close of its first century is illustrated by the frescoes of Masaccio and Filippino Lippi at the Brancacci Chapel. At this time the private architecture of the city assumed great importance. The Riccardi Palace of the Medici, the Strozzi, Pitti, Guadagni, and Rucelli palaces illustrated the different phases of Renaissance architecture from the early heavy rustic work of Brunelleschi through the changes made by Michelozzo, Cronaca, Ammanati, and others to the Barocco Period. The palace courts had their larger counterpart in the church cloisters, of which there are also several beautiful examples of the fifteenth century, such as Santa Croce, San Marco, the Annunziata, Santa Maria Novella. There are many street shrines of this time, and of these the glazed terra-cottas by Lucca della Robbia and his school are especially charming. The largest work of this style is the frieze of the Ospedale degli Innocenti. In religious architecture the Renaissance was not so dominant, and the old Gothic hall churches, with wide high aisles, and heavy, distant piers (Santa Croce, Santa Maria Novella, Cathedral), are not equaled by the correct basilical interiors of San Lorenzo and Santo Spirito, designed by Brunelleschi. The collections of art and literature throughout the city are of incalculable importance. The Egyptian Museum has assumed large proportions, and the Etruscan Museum is a synopsis of Tuscan antiquities of the pre-Roman period, admirably and scientifically arranged. Greco-Roman sculpture, mediæval and Renaissance industrial arts, and especially the great masters in sculpture and painting are represented in the Museo Nazionale, the Accademia, the Bargello, the Uffizi and Pitti palaces, and the Museo Archæologico. The Uffizi-Pitti galleries constitute one of the greatest art collections in the world. Among the important libraries are the the Biblioteca Nazionale, the Biblioteca Laurenziana, the Biblioteca Marucelliana, and the Riccardiana, containing a superb series of manuscripts as well as printed books, especially the Laurenziana.

Besides the piazzas or public squares already mentioned there are several fine public parks, of which the chief are the Cascine and the celebrated Boboli Garden, beautifully laid out and containing numerous works of art. The old fortresses of Basso and Belvedere are now used as military barracks. Cavalry barracks are situated on the Pratoni di Zecca Vecchia. Three miles from the Portò Romana, the mediæval castellated monastery of Certosa, with its interesting buildings, dating from 1341, crowns Montaguto in the Val d'Ema. Among the modern ecclesiastical buildings of Florence are the Hebrew Synagogue, the American Episcopal Church, the Anglican Church of the Holy Trinity, and Saint Mark's Anglo-Catholic Church.

The water-supply, derived from reservoirs seven miles north of Florence, has been supplemented by a modern hydraulic system which draws the water from the river above the city. Among the industries of Florence, the manufacture of art objects is important. The mosaic manufactures include a royal factory, founded in 1574, and there are numerous establishments for sculpture in marble, alabaster, and serpentine, wood-carving, and the manufacture of stained glass. Other industries comprise silk and hat manufactures, jewelry-works, porcelain potteries, and glass-factories. The United States is represented by a resident consul and vice-consul. Population, in 1894, 204,300; in 1901, 205,589.

Florence originated in a market-place, established for convenience on the Arno-watered plain, at the base of the irregular and steep hill crowned by the ancient Etruscan city, Fæsulæ (Fiesole), the ruined walls of which still exist. After the extension (about B.C. 187) of the Via Cassia to Bologna, through Arezzo and Florentia, as the Romans called Florence, the market developed into a flourishing town, and in B.C. 90, together with Fiesole, became a Latin *municipium*, with civil rights and privileges. Its public buildings included a Triad Temple to Jupiter, Juno, and Minerva, an amphitheatre, public thermæ for both sexes, Capitol and forum, the foundations of which were recently brought to light in the centre of mediæval Florence.

In B.C. 80 Sulla established a military colony here. Tacitus mentions the Florentini as sending delegates in A.D. 16 to Tiberius Cæsar at Rome to protest against a decree of the Senate which proposed to divert the waters of the Chiana from the Tiber to the Arno, to avoid the frequent inundations of the Tiber Valley. Christianity was first preached here in A.D. 313. About 405, during the episcopacy of Zanobia, one of the most famous of early Florentine prelates, Radagaisus, at the head of a mixed army of barbarians, besieged the city, but was vanquished by Stilicho, the general of the Emperor Honorius. In the sixth century Totila, the Ostrogothian King, laid the city waste, and it remained desolate until 799, when Charlemagne, during his triumphal progress to Rome, ordered its walls and public buildings to be rebuilt. Its importance increased with advancing years, and as early as the eleventh century the Florentines were European traders and the possessors of grand commercial depots in the seaports and cities of France and England; its manufactures of wool and silk were exported throughout the known world, and the skill of its workers in gold and jewels had grown proverbial.

Its government developed into a progressive form of administration, the *grandi* or nobles being represented by six consuls, and the citizens by an elected Senate of one hundred *buonuomini*. In 1115 Florence, with a part of Tuscany, was bequeathed to the popes by the Countess Matilda, who had inherited the civic jurisdiction from her mother, the Countess Beatrix.

It received an influx of population from the inhabitants of Fiesole, when their hill town was destroyed in 1125. During the bitter wars between Pope and Empire, Florence and Tuscany for a time stood aloof from the civil feud which raged throughout Italy; but in 1215 Florence became involved in the great party struggle owing to a private quarrel arising between two of her noble families, and for thirty-three years the city was distracted by the deeds of bloodshed and violence of two rival factions, who assumed the names and adopted the respective causes of Guelph and Ghibelline. (See GUELPH and GHIBELLINE.) In 1250 the citizens rebelled against the nobles, overthrew their authority, and directed public attention to democratic reforms. Twelve magistrates, or *anziani*, elected annually, were appointed in place of the consuls, and, to avoid all local dissensions, two other magistrates, strangers by birth, were elected—one, the *podestà*, was invested with supreme authority in civil and criminal cases; the other, with the title of the captain of the people, had the chief command of the militia, in which were enrolled all the youth of the State, who were bound at the call of this magistrate, and the 'sound of the bells,' the historic Florentine tocsin, to join their countrymen fully equipped for fight; twenty companies defended the town, ninety-six the country. After the death of the Emperor Frederick II., the great protector of the Ghibellines, the Guelph or Papal party gradually rose in power in Florence, and during ten years of grandeur and prosperity under their ægis the city stood not only the first in Tuscany, but one of the first of all Italy. In 1254 the Florentines first coined their golden florin, which commemorated a period of great success in the annals of Florence, whose forces had humbled Siena, Arezzo, Pisa, and Pistoja, in 1252, and in 1254 captured Volterra. In 1260 the standard of civil war was again raised by the Ghibellines of Florence, who, in league with Manfred of Naples, attacked the Guelphs and cut their forces to pieces in the sanguinary battle of Monte Aperto. The conquerors entered Florence in the name of Manfred, abolished the popular institutions, established an exclusively aristocratic executive, and even strongly advocated the entire destruction of the city as the hot-bed of Guelphism. This barbarous scheme was strenuously and successfully resisted by their leader, Uberti, immortalized by Dante for his patriotism. Pope Urban IV., French by birth, summoned against Manfred a French army, led by Charles of Anjou (brother of King Louis IX), to whom he offered the kingdom of the Two Sicilies. Manfred was defeated and slain in the battle of Benevento, and Guelph ascendency was restored throughout Italy and in Florence.

In 1266 Charles fully restored to the Florentines their internal institutions, and received their offered allegiance for ten years. In 1282 the *priori*, a new executive and commercial power, consisting of the presidents of the seven greater arts or guilds, was established in Florence; in 1293, by the consent of the *priori*, a higher chief was elected, with the title of *gonfaloniere*. In 1300 Dante was one of the *priori*, when the civil feud assumed a new form in the strife between the two factions, into which the Guelph party had split, the Neri (blacks) and the Bianchi (whites), the latter of whom soon became identified with the Ghibelline cause. Their dissensions were interrupted by the appearance of Charles of Valois, invited by Boniface VIII. to restore tranquillity, in 1301. Charles espoused the part of the Guelphs or Neri, and sanctioned every outrage on the Bianchi, who were plundered and barbarously murdered, the survivors being exiled and beggared. Among these were Dante and the father of Petrarca. In 1306 Pistoja was besieged, and taken by famine with great barbarity. In 1315 the Florentines met with a severe check from the Ghibellines of Pisa, and in 1325 were completely defeated by Castruccio Castracani, Chief of the Republic of Lucca, in the battle of Altopascio. Weakened by long dissensions, and alarmed by Castruccio's threat of marching on the city, the citizens appealed to the King of Naples for aid. They received joyfully an officer of the King, entitled the Duke of Athens, sent as royal vicar, and such was the public demoralization of the moment that they proclaimed him dictator of the Republic, unanimously suppressing the offices of *priori* and *gonfaloniere*. His ignoble intrigues to overturn the Republic caused a general popular rising and his expulsion. An attempt to admit a proportion of nobles into the Government signally failed at this time, and led to renewed animosity between them and the citizens. This was the last effort of the nobles to secure power.

A terrible plague (commemorated in Boccaccio's *Decameron*) decimated Florence in 1348, and 100,000 of her inhabitants perished. The chief power of Florence at this time was alternately wielded by the democratic families of the Alberti and the Ricci, and by their patrician rivals, the Albizzi, who for the space of fifty-three years guided the Republic in the path of independence and progress. In 1406 the Republic of Pisa fell under the sway of Florence, after a most heroic resistance. From 1434 the history of Florence is intimately connected with the House of Medici, whose influence supplanted that of the Albizzi. (See MEDICI.) Under Lorenzo de' Medici (1469-92), styled *Il Magnifico*, Florence was the great centre of the Renaissance movement which revived the arts and elegances of antiquity. The prophetic fulminations of the Dominican friar Girolamo Savonarola (q.v.), whose influence lived long after he was martyred at the stake in 1498, resulted in the expulsion of the Medici from Florence in consequence of their licentious lives, extravagance, and their aiming at sovereign power. They were restored in 1512 and again expelled in 1527. To their intrigues Florence owed her final loss of republican rights and institutions. Pope Clement VII., of the House of Medici, formed a league with the Emperor Charles V., by which the liberties of Florence were to be extinguished and the sovereign power invested in the Pope's illegitimate son, Alessandro de' Medici, who had married the Emperor's natural daughter. In September, 1529, an army of Imperialists under Emperor Charles V. entered Tuscany; on August 8, 1530, the siege of Florence terminated after a defense of eleven months, marked by unexampled devotion and bravery on the part of the citizens, in which Michelangelo as the Republic's engineer, greatly distinguished himself. Ducal government was established in 1532, and in 1569 the Florentine dominions were erected into the Grand Duchy of Tuscany. In 1861 Victor Emmanuel entered Florence, which in 1865 replaced Turin as the capital of the new Kingdom of Italy. In 1871, however, the capital was removed to Rome.

BIBLIOGRAPHY. Of the guide-book descriptions in Murray, Baedeker, and the Guides-Joanne, that of Baedeker is the best. Popular and with personal flavor are Ruskin's *Mornings in Florence* and Hare's *Florence* (London, 1884). The famous *Cicerone* of Burckhardt (Bode's ed. Leipzig, 1893, and Eng. trans.) arranges the material chronologically and according to the arts. Geymüller, *La Renaissance en Toscane*, is scientific and well illustrated. Reymond, *La Sculpture Florentine* (Florence, 1897), gives a good account of the history of Florentine sculptors of the Gothic and Renaissance. An earlier classic is Perkins, *Tuscan Sculptors* (New York, 1866). A corresponding popular account of painters is F. Cartwright's *The Painters of Florence from the Thirteenth to the Sixteenth Century* (London, 1901), and with it should be read Berenson's *Florentine Painters of the Renaissance* (New York, 1896). Good architectural details are given in A. Schütz, *Die Renaissance in Italien* (1886). For Florentine history, Giovanni Villani's *Croniche* is the keenest and most interesting of the early chronicles. Machiavelli's *Istorie Fiorentine*, a beautiful specimen of the Italian prose of the Renaissance, appeared almost simultaneously with the extinction of the liberty of the Republic by the Medici. Villari's *I Primi due secoli della storia di Firenze* (Milan, 1893) is a most masterly modern treatment of the heroic period. Consult also: Oliphant, *The Makers of Florence* (London, 1876); Taine, *Italy, Florence, and Venice*, trans. by Durand (New York, 1877); Scaife, *Florentine Life During the Renaissance* (Baltimore, 1893); Muentz, *Florence et la Toscane* (Paris, 1897); Hutton, *Literary Landmarks of Florence* (New York, 1897); Gardner, *The Story of Florence* (London, 1900).

FLORENCE. A city and the county-seat of Lauderdale County, Ala., 127 miles southwest of Nashville, Tenn.; on the Tennessee River, at the foot of the Muscle Shoals Canal, and on the Louisville and Nashville and the Southern railroads (Map: Alabama, B 1). It is finely situated on a plateau 200 feet above the river, and is the seat of the State Normal College, founded in 1872. Other features are the steel railroad and passenger bridge across the Tennessee, and Wildwood Park, of 250 acres. The manufactures, which include wagons, wooden pumps, stoves, boilers, engines, pig iron, cottonseed oil, fertilizers, staves, cotton yarns and cloth, during recent years have increased rapidly, with the development of the lumbering and mining industries of the vicinity. Florence was laid out in 1819, and was chartered as a city in 1889. The government is conducted under the charter of 1889, which provides for a mayor, elected every two years, and a unicameral council. Population, in 1890, 6012; in 1900, 6478.

FLORENCE. A city and the county-seat of Florence County, S. C., 82 miles east by north of Columbia; on the Atlantic Coast Line Railroad (Map: South Carolina, E 2). It is in a fertile agricultural region; carries on an extensive trade in cotton and tobacco; and has tobacco warehouses, stemmeries, and drying plants, cottonseed-oil mills, machine-shops, railroad repair-shops, lumber-mills, etc. An appropriation has been secured for a fine United States Government building here. The water-works, recently constructed at a cost of $50,000, are owned by the city. Population, in 1890, 3395; in 1900, 4647.

FLORENCE, COUNCIL OF. See FERRARA-FLORENCE, COUNCIL OF.

FLORENCE, WILLIAM JERMYN (1831-1891). A popular American comedian, born at Albany, N. Y., his original name being Bernard Conlin. After some experience as an amateur and in minor parts at various theatres, his real work as an actor began at Brougham's Lyceum, New York, 1850, where in 1851 he made a hit in the part of a fireman. In 1853 he married Mrs. Malvina Pray Littell, with whom he won great applause in *The Irish Boy and Yankee Girl*, repeated in London three years later. Among his most successful characters were also Bardwell Slote in *The Mighty Dollar;* Bob Brierley in *The Ticket-of-Leave Man;* and Sir Lucius O'Trigger in *The Rivals.* This last he played to the Bob Acres of Joseph Jefferson, with whom he appeared in a number of pieces from 1889 till his death, which occurred in Philadelphia.

Mrs. Florence was a dancer before her marriage, being one of the well-known Pray sisters. As an actress with her husband, one of her greatest successes was in *The Yankee Housekeeper.* She was Emily Saint Evremonde to his Bob Brierley, and Polly Eccles in his production of *Caste.* She retired from the stage before his partnership with Jefferson. Consult: McKay and Wingate, *Famous American Actors of To-day* (New York, 1896); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (New York, 1886).

FLORENCE OF WORCESTER, wụs'tẽr (?-1118). An English chronicler and monk, who lived at Worcester. In his famous work, *Chronicon ex Chronicis,* he has drawn his material largely from the work of Marianus, an Irish monk, who had written a general chronicle containing interesting facts on the history of Britain and Ireland. This work of Florence is one of the most valuable authorities on early English history. There is no information concerning the life of the author.

FLORENT, flō'räɴ', François. A French jurist of the seventeenth century. He was born at Arnay-le-Duc, Burgundy, and was professor of canonical law at Orleans and Paris. His works have been collected and published by Doujat (1679; reprinted 1763).

FLORENTINE SCHOOL OF PAINTING. The most important Italian school during the fourteenth and fifteenth centuries. It was eminent in individuality, richness of thought and other intellectual qualities, its members often being sculptors and men of science as well as painters. Their works are excellent in line and composition, and are well modeled, showing the influence of Florentine sculpture; but are not so rich in color as the Venetian. Florentine art is austere and severe; never sensuous. It is the most decorative of all Italian painting, being mostly fresco work; almost exclusively so in the fourteenth century, and predominantly so in the fifteenth. The Florentine school attained its high position through Giotto, in the latter part of the thirteenth century and the first part of the fourteenth. Throughout the fourteenth century it remained dominant in Italy, its chief representative during the latter half being Andrea Orcagna. The painting of the Renaissance originated in Florence, in the works of Masolino and Masaccio, spreading thence throughout Italy. During the fifteenth century the Florentine was the first school of Italy and the world. Among the almost incredible number of artists which it produced at this period, the most important representatives, besides those mentioned, are Fra Angelico, Filippo and Filippino Lippi, 'Sandro Botticelli, Domenico Ghirlandajo and Andrea del Verocchio. Florentine art was characterized at this time by a vigorous naturalism, which was replaced during the sixteenth century by a growing imitation of the antique. Florence produced two of the greatest masters of the High Renaissance, Leonardo da Vinci and Michelangelo, to say nothing of others like Fra Bartolomeo and Andrea del Sarto, and the influence of its masters was determinative in forming Raphael's art. But its chief artists migrated to other cities, forming the Lombard and Roman schools, and during the sixteenth century Florence lost its primacy. It still remained one of the most important art centres however. There is nothing distinctively Florentine in its painting during the Mannerist (q.v.) period, with which its school may be said to end.

Consult the authorities on Italian painting referred to under *Painting, History of,* especially Crowe and Cavalcaselle, *History of Painting in Italy* (London, 1866); Berenson, *Florentine Painters* (New York, 1896); Cartwright, *The Painters of Florence* (New York, 1901). See also Renaissance Art, and the articles on each of the painters mentioned above.

FLORES, flō'râs. An inland department of Uruguay, in the southwestern part of the State (Map: Uruguay, F 10). Area, 1744 square miles. Population, in 1900, 15,874. The surface is generally rolling, well watered, and adapted to grazing purposes. Cattle-raising is the principal industry. Considerable wheat and corn are produced. Capital, Trinidad.

FLORES, flō'râs. An island of the Malay Archipelago, lying half-way between Java and Timor, between latitudes 8° and 9° S., and longitudes 120° and 123° E. (Map: East Indies, F 6). Like most members of the group, it is of an oblong shape. It measures 200 miles in length by an average breadth of 35, with an area of about 6000 square miles. Its surface is mountainous, rising in parts to an altitude of over 9000 feet, and covered with forests. The soil is very fertile. The chief products are sandalwood and birds' nests. Population, estimated at 250,000. The government is administered by native princes, but the island is a dependency of the Netherlands and is joined for administrative purposes with Celebes and Timor.

FLORES, flō'rẽz. (1) The son of the King of the Beggars in *The Beggar's Bush,* by Fletcher and others. (2) A rich merchant in *The Merchant of Bruges,* adapted from *The Beggar's Bush.*

FLORES, flō'râs, Juan José (1800-64). A Spanish-American soldier, and the first President of the Republic of Ecuador, born at Puerto Cabello, Venezuela. He fought under Bolivar in the War of Independence, and in 1828 became commander-in-chief in the campaign against Peru. When, in 1830, Ecuador (formerly the Spanish Province of Quito) became independent and framed a constitution, he was elected President. Succeeded by Rocafuerte in 1835, he continued, as commander-in-chief of the army, to be a powerful factor in political affairs. In 1839 and 1843 he was reëlected to the Presidency, which in 1845 he resigned in consequence of a military revolution instigated by the Liberals. He assisted President Moreno in 1860 against the insurgents, whose leader, Franco, he overthrew at Babahoyo. While commanding the army of Ecuador in the war against Colombia in 1863, he was defeated by the dictator Mosquera at Cuaspuda.

FLORES, Venancio (1809-68). A Spanish-American soldier, and a President of Uruguay, born in Paysandú. In 1853 he was leader of the so-called 'Colorados,' or advanced party, in the revolt against the Government, and was himself elected President. A counter-revolt having arisen in 1855, he withdrew to the Argentine Confederation, whose military service he entered. Aided by President Mitre of the Confederation and by Brazil, in 1865 he entered Montevideo in triumph, and became Provisional Governor of the Republic of Uruguay. In 1866 he was elected President. He joined Brazil and Argentine in the triple alliance against Paraguay, and for a time commanded the allied forces. On February 15, 1868, he resigned the Presidency, and four days afterwards was assassinated during disturbances incident to a recurrence of revolution.

FLORES′CO, or **FLORESCU,** Jean Emmanuel (1819-93). A Rumanian soldier and politician. He was born at Rimnik, studied at Bucharest, and at the Ecole d'Etat-Major of Paris, and during the Crimean War served as a colonel in the Russian Army. Previous to 1877 he was several times Minister of War, and effected many reforms in the military establishment of Rumania. In 1890 he became president of the Senate, and in 1891 president of the Ministry. His policy was strongly influenced by friendship for Russia.

FLOREZ, Henrique (1701-73). A Spanish historian, born at Valladolid. He wrote many works on the history and archæology of his country, among which are *Clave historial* (1743); *La España sagrada—teatro geográfico, histórico de la iglesia de España* (1747-73); *España carpetana, medallas de las colonias, municipios y pueblos antiguos de España* (1757-75), completed by Risco Fernandez and others, and *Memorias de las reynas católicas* (1770).

FLOREZ (flō′râth) **ESTRADA,** Alvaro (1769-1853). A Spanish political economist. He was born at Pola de Somiedo, Asturias, of which province he became procurator-general in 1808. He took the initiative in the uprising against Napoleon I., and as an ardent patriot again defended the rights of the nation as against King Ferdinand VII. in his *Representación á Fernando VII.*, which created a great stir and was frequently reprinted and translated. His *Curso de economía politica* (5th ed. 1843) was published in France during his exile.

FLORIAN, flô′rē-äN′, Jean Pierre Claris de (1755-1794). A French poet and romancer. He was born near Anduze, Languedoc, of noble and partly Spanish blood, and was related to Voltaire, who patronized his youth, as other powerful men of culture did his maturity. He served for a time in the army, but soon resigned to devote himself to literature. He was imprisoned at the outbreak of the French Revolution and did not long survive the effects of his incarceration. He first attracted attention in 1782 by versified epistles and eclogues, imitated Cervantes and Gessner in his *Galatée* (1783) and Fénélon and Marmontel in *Numa Pompilius* (1786), an educational work of wide popularity. This opened to him the Academy (1788), and in that year he published his best work, the pastoral *Estelle*. The famous *Gonzalve de Cordoue* (1791) and a once famous collection of *Fables* in the manner of Lafontaine completed his works, though he left unfinished a *Guillaume Tell* and an abridgment of *Don Quixote*. He died in Paris September 13, 1794. All his works (20 vols., Paris, 1824) are delicately sentimental, turning to idyllic artificiality the nature-cult of Rousseau. Consult: Montvaillant, *Florian, sa vie, ses œuvres, sa correspondance* (Paris, 1879); and Claretie, "Florian," in the *Classiques populaires* (Paris, 1888).

FLO′RIAN (Lat. *Florianus*), Saint (?-c.303). The patron saint of Upper Austria. It is said that he was born in what is now Austria, served in the Roman Army, and was thrown into the Enns, weighted with a stone, and drowned during the Diocletian persecution, about 303. He was buried on the site of the Augustinian monastery of Saint Florian, eight miles southeast of Linz. An untrustworthy tradition says that the remains were afterwards taken to Rome, and in 1183 were transferred to Cracow. He is represented as pouring flames from a vessel, and is invoked for protection against fire. His day is May 4th.

FLO′RIANAP′OLIS. See Desterro.

FLO′RIAN'S. The best-known café of Venice, on the Piazza San Marco. It has been a resort for Venetians and travelers for two centuries.

FLO′RICAN, or **FLO′RIKIN.** A genus of large game-birds, nearly allied to the bustards, two species of which inhabit the open districts of India—the larger or Bengal florican (*Sypheotides Bengalensis*), and the lesser (*Sypheotides aurita*). They go about in small flocks, extremely shy, wary, and strong of flight; and in the winter offer excellent sport to the gunner, and are highly prized as delicate food. Both species are mainly black, with crests and ear-tufts, and with white markings on the wings; but the females and young of the Bengal species are mottled brown and white.

FLORICULTURE (from Lat. *flos*, flower + *cultura*, cultivation, from *colere*, to cultivate). The cultivation of plants for æsthetic purposes. In its widest sense floriculture embraces the growing of plants in windows, as well as in greenhouses and gardens, and some of its phases are closely linked on the one hand with arboriculture, and on the other with landscape gardening (qq.v.). In floriculture plants are grown for their individuality; in landscape gardening for their effect in the landscape picture. From early times flower-growing has been practiced in all civilized countries, but its development as a business of commercial importance, especially in America, is of comparatively recent date. Commercial floriculture in the United States is scarcely a century old; but its progress has been steady, and during the last half of the nineteenth century very rapid. In 1825 there was scarcely any capital invested in greenhouses and gardens, except for the pleasure of the owners; in 1899 there were about 9000 commercial florists' establishments having an average of 2500 square feet of glass each (an area that in 1825 would have been considered very large), or a total of 22,500,000 square feet. The estimated value of these establishments was 50 cents per square foot, or a total of $11,250,000. The value of the output was about $22,500,000. The retail value of cut flowers was estimated at $12,500,000, apportioned as follows: Roses, $6,000,000; carnations, $4,000,000; violets, $750,000; chrysanthemums, $500,000; lilies and miscellaneous flowers, $1,250,000. The retail value of the plants sold was estimated at $10,000,000. See articles on flowers mentioned above. Consult: Henderson, *Practical Floriculture*

(New York, 1887); Hunt, *How to Grow Cut Flowers* (Terre Haute, 1893); Taft, *Greenhouse Management* (New York, 1898); Scott, *Florists' Manual* (Chicago, 1899); Bailey, *Cyclopedia of American Horticulture* (New York, 1900).

FLOR'IDA (Sp., flowery, so called by Ponce de Leon, either from his discovery of it on Easter, Sp. *Pascua florida, Pascua de flores,* flowery Easter, or, less probably, on account of the abundance of flowers which he saw). Known both as the 'Everglade State' and as the 'Peninsula State.' The southernmost State of the American Union, situated between latitudes 24° 30′ and 31° N. and longitudes 79° 48′ and 87° 38′ E. It is bounded on the north by Alabama and Georgia, on the east by the Atlantic Ocean, on the south by the Strait of Florida and the Gulf of Mexico, and on the west by the Gulf of Mexico and Alabama, the extreme westward boundary being defined by the Perdido River. The greatest length from north to south is about 450 miles, and the extreme width of the northern or continental portion is nearly 400 miles. The peninsular extension has a length of 375 miles, with an average width of 95 miles. Florida ranks second in size among the States east of the Mississippi River; its total area is 58,680 square miles, of which 4440 square miles are occupied by lakes and rivers.

Surface and Hydrography. The coastal lands are low, monotonously level, and often marshy. The grassy Everglades and the Big Cypress Swamp cover a large portion of the peninsula south of Lake Okeechobee, and there are large areas of swampland in the northern part, especially along the lower course of the Apalachicola River, and west of Saint Mary's River where the Okefinokee Swamp extends just south of the Georgia State line. Toward the interior of the peninsula the surface rises very gradually to an altitude of more than 100 feet, the central ridge in places reaching nearly 300 feet. Western Florida resembles southern Alabama in its surface features and is generally hilly and well wooded. The Florida Keys, stretching in a curved line 200 miles long from Biscayne Bay southwestward into the Gulf, are remarkable examples of the work of coral organisms. They form a continuous reef, the upper portions of which have been extended both vertically and laterally by accretions of sand and floating materials, and by the growth of vegetation until now there are many habitable islands. The surface of the keys is generally less than 10 feet above sea-level.

The coast-line of Florida measures about 470 miles on the Atlantic and 675 miles on the Gulf of Mexico. The eastern coast has remarkably even shore-lines, being much more regular than the western coast, which is broadly indented by the Gulf, and intersected by the inlets of several rivers. Almost the entire length of the eastern coast is bordered by sand reefs, inclosing long lagoons that tend to fill up with sand and organic matter and to become land. On this side there are few good harbors. Extensive improvements have been made at the mouths of Saint Mary's and Saint John's rivers, and these waters are now open to navigation for light-draught boats, while the harbors of Saint Augustine and Biscayne Bay are used to some extent by sea-going craft. There are numerous good harbors among the Florida Keys, the most important commercially being that at Key West. On the western side Charlotte Harbor and the bays of Tampa and Pensacola can be entered by large vessels. Florida has an extensive river system which includes over 1000 miles of navigable waters. Three large rivers, the Apalachicola, Suwanee, and Choctawhatchee, enter the State from the north and cross western Florida to the Gulf. Within the peninsula the most important streams are the Saint John's River on the Atlantic side, navigable for over 200 miles, the Withlacoochee and Peace rivers draining into the Gulf, and the Kissimmee, which flows southward through the middle of the peninsula, and is a feeder of Lake Okeechobee. Most of the lakes occur in central Florida, along the drainage basins of the Saint John's and Kissimmee rivers. Here there are a great number, including lakes George, Harris, Apopka, Tohopekaliga, Kissimmee, and Okeechobee. The last named, with an area of 1200 square miles, is the largest in the State.

Soil and Climate. Owing to the great length of coast-line in proportion to the area and to the low elevation, Florida possesses a climate of remarkable uniformity. The average extreme range of temperatures in central and southern Florida is included within the limits of 90° and 43° F. In northern Florida the thermometer falls at times considerably below 32° for brief periods. In summer the heat is less oppressive than in the Middle and North Atlantic States. The average annual temperatures at various localities in the State are as follows: Jacksonville, 69°; Pensacola, 68°; Sanford, 72°; Cedar Keys, 71°; Key West, 78°. The rainfall is generally heaviest on the Gulf Coast, Pensacola having an annual average of 67 inches, compared with 55 inches at Jacksonville. At Tarpon Springs the mean for the year reaches the high figure of 85 inches. With its equable and healthful climate Florida offers an attractive home for invalids, and has become a favorite winter resort of tourists.

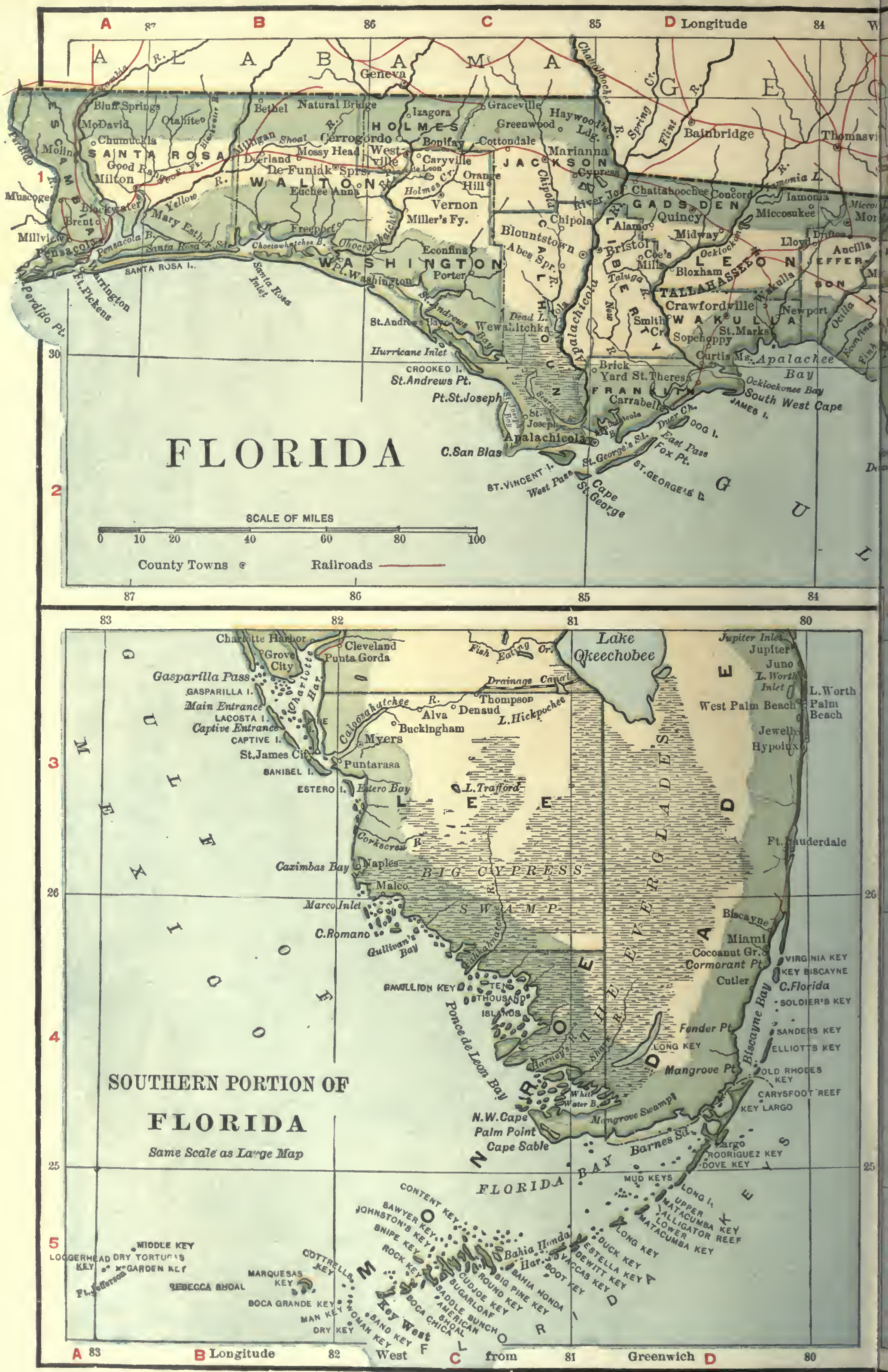
Much of the soil is sandy, supporting only a stunted growth of vegetation. There is everywhere, however, a substratum of limestone, and when this approaches the surface it yields a fertile soil. Clay and loam lands are of limited extent. The warm, humid climate promotes a rapid and vigorous plant-growth, even where the land is not especially fertile.

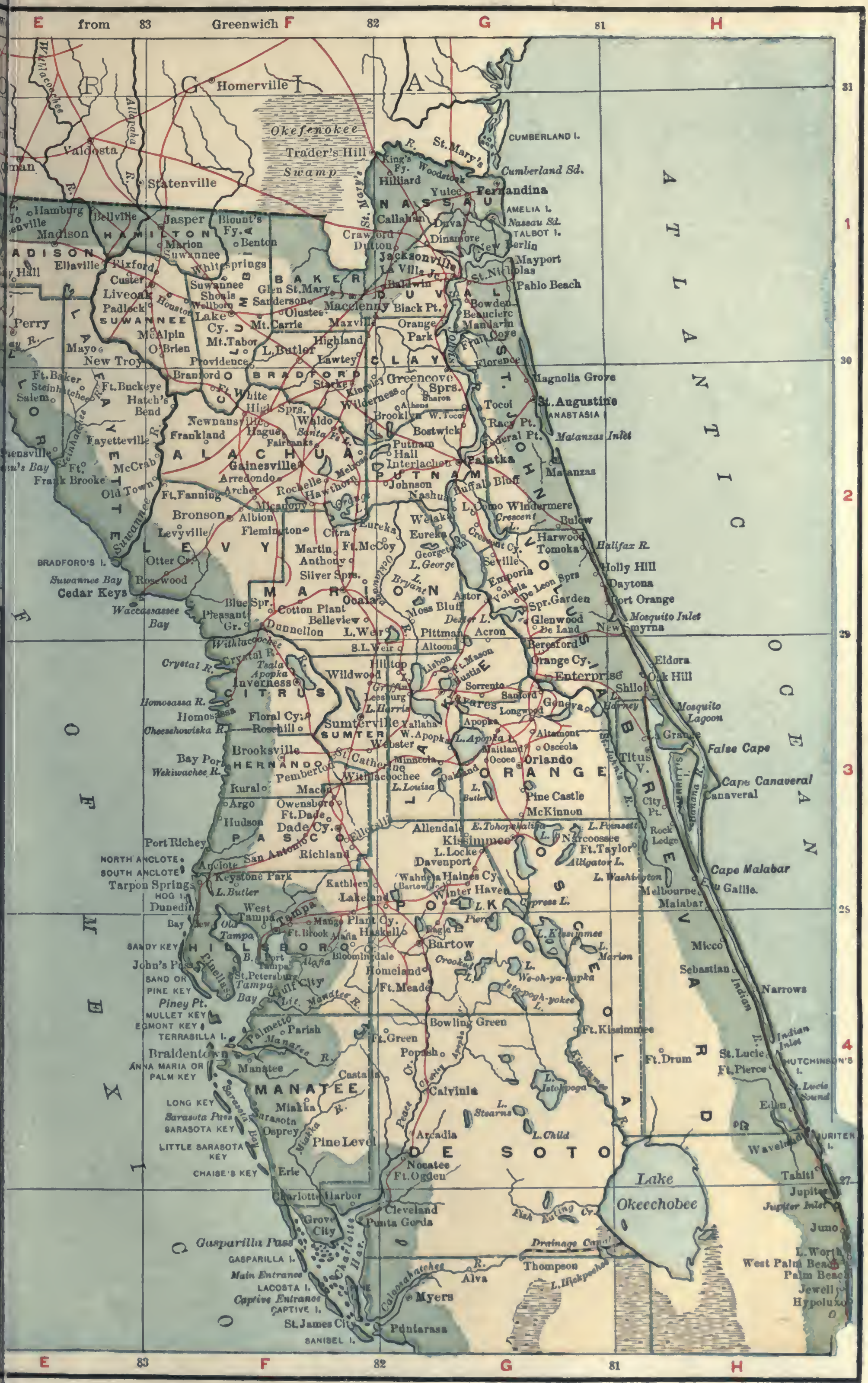
Flora. The striking feature of the flora of Florida is the pine forests, which occupy the sandy soil of the north and gradually become thinner southward in the peninsula, where the pines are more or less mixed with palmettos, especially where the soil becomes moist. These forests are interrupted in the northern half of the peninsula by grassy plains and marshes, which become more frequent in the south, where they are replaced by the Everglades (q.v.). Many of the streams, especially the Saint John's River, are bordered or even choked with the water-hyacinth. Where the character of the soil is favorable, trees and smaller plants grow in profusion of species and, especially in the southern part, with tropical luxuriance. Some of the common species are magnolia, live oak, persimmon, sweet-gum, passion-flower, pitcher-plant, hibiscus, and wistaria. See *Flora*, under United States. For Fauna, see paragraphs under America and United States.

Geology. Florida is an outgrowth of the southern coastal plain, and is of recent geological

AREA AND POPULATION OF FLORIDA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Alachua	F 2	Gainesville	1,283	22,934	32,245
Baker	F 1	Macclenny	585	3,333	4,516
Bradford	F 2	Starke	552	7,516	10,295
Brevard	H 3	Titusville	2,409	3,401	5,158
Calhoun	C 1	Blountstown	1,067	1,681	5,132
Citrus	F 3	Inverness	612	2,394	5,391
Clay	G 1	Greencove Springs	622	5,154	5,635
Columbia	F 1	Lake City	792	12,877	17,094
Dade	H 6	Miami	4,424	861	4,955
De Soto	G 4	Arcadia	3,755	4,944	8,047
Duval	G 1	Jacksonville	822	26,800	39,733
Escambia	A 1	Pensacola	668	20,188	28,313
Franklin	D 2	Apalachicola	731	3,308	4,890
Gadsden	D 1	Quincy	500	11,894	15,294
Hamilton	E 1	Jasper	508	8,507	11,881
Hernando	F 3	Brooksville	475	2,476	3,638
Hillsboro	F 4	Tampa	1,309	14.941	36.013
Holmes	C 1	Westville	435	4,336	7,762
Jackson	C 1	Marianna	963	17,544	23,377
Jefferson	E 1	Monticello	593	15,757	16,195
Lafayette	E 2	Mayo	1.202	3,686	4,987
Lake	G 3	Tavares	1,128	8,034	7,467
Lee	G 6	Myers	4,641	1,414	3.071
Leon	D 1	Tallahassee.	730	17,752	19,887
Levy	F 2	Bronson	1,133	6,586	8,603
Liberty	D 1	Bristol	725	1,452	2,956
Madison	E 1	Madison	693	14,316	15,446
Manatee	F 4	Braidentown	1,275	2,895	4,663
Marion	F 2	Ocala	1,640	20,796	24.403
Monroe	G 6	Keywest	1,125	18,786	18.006
Nassau	G 1	Fernandina	645	8,294	9,654
Orange	G 3	Orlando	1,315	12,581	11,374
Osceola	G 4	Kissimmee	1,827	3,133	3,444
Pasco	F 3	Dade City	750	4,249	6,054
Polk	G 3	Bartow	1,967	7,905	12,472
Putnam	G 2	Palatka	772	11,186	11,641
St. John	G 2	Saint Augustine	960	8,712	9,165
Santa Rosa	A 1	Milton	1.528	7,961	10,293
Sumter	F 3	Sumterville	599	5.363	6,187
Suwanee	E 1	Liveoak	689	10,524	14,554
Taylor	E 1	Perry	1,100	2,122	3,999
Volusia	G 2	De Land	1,281	8,467	10.003
Wakulla	D 1	Crawfordville	601	3,117	5,149
Walton	B 1	De Funiak Springs	1,384	4,816	9,346
Washington	C 1	Vernon	1,425	6,426	10,154


FLORIDA
SCALE OF MILES
0 10 20 40 60 80 100
County Towns
Railroads
Longitude
A B C D
87 86 85 84
1 2 3 4 5
30 26 25
83 82 81 80
ALABAMA
GEORGIA
ESCAMBIA
SANTA ROSA
WALTON
HOLMES
WASHINGTON
JACKSON
CALHOUN
GADSDEN
LIBERTY
LEON
WAKULLA
FRANKLIN
JEFFERSON
Geneva
Bainbridge
Thomasville
Bluff Springs
McDavid
Chumuckla
Molino
Muscogee
Millview
Pensacola
Brent
Milton
Good Range
Otahite
Bethel
Natural Bridge
Milligan
Deerland
De Funiak Sprs.
Mossy Head
Cerrogordo
Euchee Anna
Westville
Bonifay
Caryville
Izagora
Graceville
Greenwood
Cottondale
Marianna
Cypress
Orange Hill
Vernon
Miller's Fy.
Freeport
Econfina
Porter
Pt. Washington
St. Andrews Bay
Wewahitchka
Blountstown
Abes Spr.
Chipola
River Jct.
Chattahoochee
Concord
Quincy
Midway
Alamo
Bristol
Coe's Mills
Bloxham
TALLAHASSEE
Iamonia
Miccosukee
Lloyd
Drifton
Aucilla
Crawfordville
Newport
St. Marks
Sopchoppy
Smith Cr.
Curtis Mls.
Brick Yard
St. Theresa
Carrabelle
Apalachicola
St. Joseph
Pt. St. Joseph
St. Andrews Pt.
Hurricane Inlet
CROOKED I.
C. San Blas
ST. VINCENT I.
West Pass
St. George's Sd.
Cape St. George
ST. GEORGE'S I.
East Pass
Fox Pt.
DOG I.
Dyer Ch.
JAMES I.
South West Cape
Ocklockonee Bay
Apalachee Bay
Perdido Pt.
Ft. Pickens
Warrington
SANTA ROSA I.
Santa Rosa Inlet
Santa Rosa Sd.
Pensacola B.
Choctawhatchee B.
Mary Esther
Blackwater
Yellow R.
Perdido R.
Choctawhatchee R.
Chipola R.
Apalachicola R.
Chattahoochee R.
Flint R.
Spring Cr.
Ocklockonee R.
Wakulla
Ocilla
Econfina
Haywood's Ldg.
Holmes Cr.
Shoal R.
GULF
SOUTHERN PORTION OF FLORIDA
Same Scale as Large Map
GULF OF MEXICO
LEE
DADE
MONROE
Lake Okeechobee
THE EVERGLADES
BIG CYPRESS SWAMP
Fish Eating Cr.
Drainage Canal
Charlotte Harbor
Charlotte Har.
Grove City
Cleveland
Punta Gorda
Gasparilla Pass
GASPARILLA I.
Main Entrance
LACOSTA I.
Captive Entrance
CAPTIVE I.
PINE I.
St. James City
SANIBEL I.
Punta Rassa
Ft. Myers
Caloosahatchee R.
Alva
Denaud
Thompson
Buckingham
L. Hickpochee
L. Trafford
ESTERO I.
Estero Bay
Corkscrew R.
Naples
Caximbas Bay
Malco
Marco Inlet
C. Romano
Gullivan's Bay
Fahkahatchee R.
PAVILLION KEY
TEN THOUSAND ISLANDS
Ponce de Leon Bay
Harney's R.
Shark R.
White Water B.
N.W. Cape
Palm Point
Cape Sable
Mangrove Swamp
Jupiter Inlet
Jupiter
Juno
L. Worth Inlet
L. Worth
Palm Beach
West Palm Beach
Jewell
Hypoluxo
Ft. Lauderdale
Biscayne
Miami
Cocoanut Gr.
Cormorant Pt.
Cutler
VIRGINIA KEY
KEY BISCAYNE
C. Florida
SOLDIER'S KEY
Biscayne Bay
SANDERS KEY
ELLIOTTS KEY
OLD RHODES KEY
CARYSFOOT REEF
KEY LARGO
Fender Pt.
LONG KEY
Mangrove Pt.
Barnes Sd.
Largo
RODRIGUEZ KEY
DOVE KEY
FLORIDA BAY
MUD KEYS
LONG I.
UPPER MATACUMBA KEY
ALLIGATOR REEF
LOWER MATACUMBA KEY
LONG KEY
DUCK KEY
ESTELLA KEY
DEWITT KEY
VACCAS KEY
BOOT KEY
Bahia Honda Har.
BAHIA HONDA KEY
BIG PINE KEY
ROUND KEY
CUDJOE KEY
SUGARLOAF KEY
SADDLE BUNCH
AMERICAN SHOAL
BOCA CHICA
Key West
SAND KEY
WOMAN KEY
MAN KEY
DRY KEY
BOCA GRANDE KEY
MARQUESAS KEY
COTTRELLS KEY
ROCK KEY
SNIPE KEY
JOHNSTON'S KEY
SAWYER KEY
CONTENT KEY
FLORIDA KEYS
REBECCA SHOAL
MIDDLE KEY
LOGGERHEAD KEY
DRY TORTUGAS
GARDEN KEY
Ft. Jefferson
Longitude West from Greenwich



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formation. The underlying strata are mostly limestones deposited during the Upper Eocene age. In the southern part of the peninsula the presence of fossil coral reefs indicates that the land has been built up by successive stages in a process similar to that now going on in the Florida Keys.

Mineral Resources. Phosphate rock, the most valuable of the State's mineral resources, occurs along a belt extending from Lake Okeechobee to near Tallahassee. Since the discovery of the deposits in 1888 an important mining industry has been developed, the output increasing steadily up to 1899, when the total was 706,677 long tons, valued at more than $2,500,000. In 1900 the production declined to 642,321 tons, owing to a decrease in the demand. Three grades of material are produced—hard rock, land pebble, and river pebble; the proportion of lime phosphate ranges from 50 per cent. in river pebble to over 80 per cent. in hard rock. Of the latter grade practically the entire output is exported to Europe, where it finds a ready market in spite of the competition of French and Algerian phosphates. The hard-rock and land-pebble deposits are worked either by sinking pits through the light overburden or by hydraulic mining. River pebble occurs in the basins of the Peace, Caloosahatchee, and Alafia rivers, but it is found only along the Peace in deposits of sufficient extent to warrant exploitation. Centrifugal pumps mounted on steam dredges are used for raising the material from the river-bed. Florida also produces most of the domestic supply of fuller's earth from deposits near Quincy. The output in 1900 was 11,813 short tons, valued at $70,565. There are no metallic mines in the State.

Fisheries. The long coast-line of the State gives the advantage of extensive adjacent fishing waters, and while the fisheries are not fully developed, they are more important than those of any other Gulf State. In 1897 6100 men were engaged in the industry, about four-fifths of them on the Gulf coast, and the product was valued at $1,100,000. Shad and mullet are the east coast product, while sponges constitute nearly one-third of the west coast product. Mullet and turtle are also caught in great numbers on the west coast. Key West is the centre of the sponge fisheries, and in 1897 102 vessels and 184 boats were engaged in this industry. Florida has a monopoly of the sponge fisheries, but returns from this source have fallen off, and the product is of a poorer quality than formerly.

Agriculture. The equable subtropical climate of Florida determines the nature of its products. Since the end of the Civil War the area of farm land has constantly increased, amounting in 1900 to 12.6 per cent. of the land area of the State, or 4,363,800 acres, of which 34.6 per cent. are improved. During the same period there has been, as a consequence of the change in the industrial system, a remarkable decrease in the average size of farms, the average in 1900—106.9 acres—being less than one-fourth that of 1860. There are twice as many farms operated by white as by colored farmers, and the average size tended by the latter is only 53 acres, as against 133.6 acres for those operated by white farmers. A style of contract is common among the negro farmers which makes classification of tenure difficult, but the census of 1900 reported 40.6 per cent. of the total number of negro farmers as being renters according to the cash-rent system, and 10.2 per cent. as following the share-rent system, the corresponding figures for white farmers being respectively 8.8 per cent. and 5.7 per cent. The negro farmers are centred largely in the cotton-growing counties, and the white landlord still in great part owns the farm implements and working animals used by the negro tenant; but the status of the negro farmer, as indicated by census comparisons, has improved, particularly during the last decade of the century.

Only a small portion of southern Florida, including the Everglades (q.v.) region, has as yet been brought under cultivation, but in the light of recent progress and investigation a considerable area is thought to be reclaimable. Along the east coast, in Brevard and Dade counties, over 81 per cent. of the pineapples of the State are grown, constituting a thriving industry, in which Florida enjoys a monopoly among the States. Hillsboro County and other west coast counties to the southward are becoming prominent in the production of oranges, containing in 1899 20.9 per cent. of all the orange-trees of the State, as against only 6.3 per cent. in 1889, while the production in the latter year amounted to 89.8 per cent. of the total for the State. Orange culture became prominent some decades ago in the central section of the State, and previous to the cold wave of the winter of 1894-95, which, with the frosts of 1899, killed about three-quarters of the orange-trees, the annual output approximated $5,000,000 in value. It was in fact the most valuable product of the State. Disastrous frosts are rare, however, and the orange-growing industry is rapidly reviving, the total number of trees in 1900 being 2,552,542, almost as great as in 1890, and amounting to a little less than one-half the number of orange-trees in California. Cassava, egg-plant, and other subtropical plants flourish in the central section, and tomatoes and various garden products are extensively grown for the early Northern markets. In the northern portion of the State the products are similar to those of the other Gulf States. In amount of acreage corn is in excess of any other crop, but the yield per acre is low. The acreage increased over 50 per cent. in the last decade of the century. Other cereals received but little attention, oats and rice being the only ones worthy of mention. From 1890 to 1900 the acreage of oats increased from 5410 to 31,467, and of rice from 1787 to 5410. Rivaling corn in value of product is cotton, over one-half of the acreage being devoted to the sea-island variety, the State ranking next to Georgia in the acreage devoted to this plant. The total production of cotton, however, is small compared with that of the other southern coast States, and there has been no tendency to increase for a number of years. Tobacco, beans, peas, and peanuts are extensively grown, the last being of greatest importance. The value of the peanut crop has exceeded $900,000 for a year; the area devoted to the nuts in 1899 was two and a half times that of 1889. The sweet-potato crop is of about equal value. Peaches, pears, and other fruits of the temperate zone are successfully raised. Hay and sugar-cane are produced in various parts of the State. Besides the Everglades, there is much unreclaimed swamp and pine land scattered over the State, especially in the region south of Alabama. Some irrigation is practiced in connection with garden farming. In 1898 the public lands of the State—exclusive of swamp lands granted to the State—amounted to 1,757,000 acres. The State contains much excellent pasture land, especially in the central portion, and rapidly increasing numbers of cattle are raised. The decrease shown in the table in the number of dairy cows is only an apparent one, being due to a change in census methods. Horses, swine, and sheep are raised in considerable numbers. The following tables show the relative importance of the principal crops and farm animals, and the changes which occurred in the last census decade:

YEARS	Corn, acres	Oats, acres	Rice, acres	Peanuts, acres	Sweet potatoes, acres	Sugar-cane, acres	Hay, acres	Cotton, acres
1900	569,567	31,467	5,410	69,452	22,791	12,800	21,994	221,839
1890	378,906	5,410	1,787	26,166	18,698	9,345	7,661	227,370

YEARS	Dairy cows	Other neat cattle	Horses	Mules	Sheep	Swine
1900	78,830	534,038	40,572	13,562	102,709	464,277
1890	113,388	370,176	31,807	9,624	98,275	374,241

Manufactures. Manufacturing has always held a minor place in the economic activities of the State, but recently it has made remarkable progress. The total annual product ($48,000,000) more than doubled during the last decade of the nineteenth century. The manufacture of cigars and cigarettes is of great importance. This is confined largely to the southern portion of Florida—particularly to Tampa and Key West—and is the outgrowth of the immigration of Cubans to these parts. A large part of the raw tobacco is imported from Cuba—the port of Tampa being exceeded in the year 1900 by New York alone in amount received from that island. The following table, taken from the United States Census Reports (1900), shows the relative value of the different manufactures and the changes during the last decade of the century:

INDUSTRIES	Year	Number of establishments	Wage-earners, average number	Value of products, including custom work and repairing
Total for selected industries for State	1900	1,104	33,101	$32,059,830
	1890	431	10,960	14,905,966
Increase, 1890 to 1900		673	22,141	$17,153,864
Per cent. of increase		156.1	202.0	115.1
Per cent. of total of all industries in State	1900	52.2	89.2	83.9
	1890	53.5	83.5	81.8
Tobacco, cigars, and cigarettes	1900	128	6,461	10,891,286
	1890	86	5,273	8,123,220
Printing and publishing	1900	100	406	603,410
	1890	86	468	567,808
Cars and general shop construction and repairs by steam railroad companies	1900	13	958	1,112,245
	1890	10	280	354,043
Fertilizers	1900	7	117	555,394
	1890	3	23	86,137
Lumber and timber products	1900	416	7,081	10,848,403
	1890	215	4,363	5,514,879
Tar and turpentine	1900	425	17,937	7,794,101
	1890	15	484	191,859
Ship-building	1900	15	141	254,991
	1890	16	69	68,020

Forests and Forestry. The most important factor in the manufactures of the State is its extensive forest area, which yields nearly one-half of the value of the total manufactured product. The forests cover over two-thirds of the total land area, the long-leaved pine extending over about 6600 square miles. From the forests of pitch-pine, tar, turpentine, and rosin are produced, and these products have increased during the last decade from almost nothing to a large figure. (See Table.) From the live-oak forests timber for ship-building is secured. As will be seen, the lumber and timber products have doubled in value during the last decade. The forest resources are found mainly in the northwest portion of the State, and timber worked in the Florida mills.

Transportation and Commerce. Florida is well provided with means of communication, both by land and by water. In 1900 there were 3255 miles of railroad, most of which was constructed during the two preceding decades. In 1880 there were but 518 miles, while in 1890 there were 2489 miles. There are 21 lines now in operation, of which the three longest are the Florida Central and Peninsular, 689 miles; Savannah, Florida and Western, 618 miles; and the Florida East Coast, 484 miles. In 1897 and 1899 the Legislature provided for a Railroad Commission to fix and enforce rates, the courts to hold the rates thus imposed as prima facie reasonable. The validity and constitutionality of this State Commission have been fully established by the Florida Supreme Court, and it is now one of the most effective in the United States. In the natural means of communication Florida excels, its peninsular shape affording more coast-line than that of any other State. This advantage is supplemented by many navigable rivers and bays.

The river and harbor facilities have recently been greatly improved as a result of the heavy Congressional appropriations for that purpose. Thus aided, the commercial development of the State advanced very rapidly during the last years of the nineteenth century. In 1899, 2840 vessels, aggregating 2,464,026 tons, cleared the ports of Florida. The places having the largest export trade were Pensacola, Tampa, and Jacksonville; other export centres are Fernandina, Key West, Punta Gorda, Carrabelle, Apalachicola, and Saint Augustine. Most of these export forest products and phosphate for both foreign and home markets. Pensacola has large foreign shipments of grain, cotton, and tobacco. Tampa and Key West have a large trade in cigars. Punta Gorda exports vegetables and fish, and Carrabelle large quantities of turpentine.

Finance. The receipts for the year ending December 31, 1900, amounted to $989,058, and the disbursements were $936,915. Only $190,800 of the $1,032,000 bonded debt of the State were in the hands of private individuals.

Banks. In October, 1900, there were 17 national banks in operation with an aggregate capital stock of $1,255,000; circulation outstanding, $642,000; deposits, $6,600,000; and reserve, $2,318,000. In June of the same year there were 23 State banks, with $4,643,000 resources, $742,000 capital, and $3,489,000 deposits. There was but one savings bank.

Population. The following is the population of Florida by decades: 1830, 34,730; 1840, 54,477; 1850, 87,445; 1860, 140,424; 1870, 187,748; 1880, 269,493; 1890, 391,422; 1900, 528,542—230,730 negroes.

The absolute increase from 1890 to 1900 was greater than for any previous decade. In 1900 the average number of persons to the square mile was 9.7. Cities exceeding 10,000 in population were: Jacksonville, 28,400; Pensacola, 17,700; Key West, 17,100; Tampa, 15,800. The foreign-born population numbered 23,832, most of whom were from Cuba and the West Indies. The tendency to segregate in cities is slightly more marked than in the neighboring States. There are six places of over 4000 inhabitants, constituting 16.5 per cent. of the total population.

Religion. About one-half of the church members of Florida belong to the Methodist Church; more than two-thirds of the remainder are Baptists; other denominations represented are: Catholic, Presbyterian, Protestant Episcopal, Disciples of Christ, Congregational, and Lutheran. Of these the Catholics are the strongest.

Education. Education in Florida is in an unsatisfactory state. The average length of the school year generally falls under 100 days, which is true of but few other States. The average expenditure per capita of population is only one-half that for the United States as a whole, and less than one-third the average for the States, excluding those formerly holding slaves. There is a recent decrease in illiteracy attributable to the dying off of adults rather than to improvements in educational methods. In 1900 the illiterates ten years of age and over were about 22 per cent. of the total number of that age, a larger per cent. of illiteracy being shown in but eleven other States and Territories. The educational status is attributable to the presence of a large negro population, though the burden of negro education in itself is not so prominent a factor in the situation as is usually supposed. A process of transportation of students and consolidation of schools has resulted in a decrease in the actual number of schools, but the per cent. of attendance is slowly increasing for both whites and blacks. There are about thirty public and private secondary schools in the State, and two public and three private normal schools. Other higher State institutions of learning are as follows: Agricultural College at Lake City, East Florida Seminary and Military Institute at Gainesville, West Florida Seminary at Tallahassee, and South Florida Military and Educational Institute at Bartow. There are also the following private and denominational colleges: John B. Stetson University at De Land, one of the institutions affiliated with the University of Chicago; Florida Conference College, at Leesburg; Rolin's College, at Winterpark; and Saint Leo Military College, in Pasco County.

Charitable and Penal Institutions. The State maintains an institution for the blind, deaf, and dumb at Saint Augustine, and a State Reform School at Marianna. There are a hospital for the insane and a Confederate Soldiers' and Sailors' Home at Tallahassee. The number of State convicts in recent years has averaged about 700. Of these nearly six-sevenths are colored. Florida, in common with some other Southern States, still follows the questionable method of farming out convicts to contractors, thus avoiding the heavy expenses incurred by other penal systems—indeed, actually making them a source of income to the State. In 1900 the convicts were divided into 13 camps, 7 of which were engaged in mining phosphate and 6 in the manufacture of naval stores.

Government. The present Constitution was ratified by popular vote in November, 1886. An amendment may be adopted by a three-fifths vote of each House and the approval of a majority of the electors of the State voting at a general election. A constitutional convention may be called if demanded by a two-thirds vote of each House and the approval of the majority of the State electors voting at a general election. Suffrage is granted to male persons of twenty-one years, who are citizens of the United States, or who shall have declared their intention of becoming such, and have lived in Florida one year and in the county six months. Since 1880 there has been an educational qualification for voters. The registration of voters is required.

Legislature. The Legislature meets on the first Tuesday after the first Monday in April of even years. There are 32 Senators chosen for four years, and 68 Assemblymen for two years; legislative sessions are biennial, and limited to 60 days; members have $6 a day and mileage. A bill may embrace but one subject, and may originate in either House. All impeachments are made by the House and tried by the Senate. A two-thirds vote of the members present in each House overrides the Governor's veto.

Executive. The Governor is elected for four years and cannot succeed himself. There are also elected for the same term of office a secretary, comptroller, attorney-general, commissioner of agriculture, treasurer, and superintendent of public instruction. The first four of these, together with the Governor, may remit fines and forfeitures, commute punishment, and grant pardons. Should the Governorship become vacant it will be filled by the president of the Senate, and if again vacant, by the speaker of the House.

JUDICIAL. There are a Supreme Court consisting of a chief justice and two associates, elected for a term of six years, also circuit, criminal, and county courts, and justices of the peace. Seven circuit court judges are appointed for six years, and each holds annually two court sessions; county court judges are elected for four years. The county commissioners divide the counties into justice districts, in each of which a justice of the peace is elected for four years. Each county elects a prosecuting attorney and each justice district a constable.

LOCAL GOVERNMENT. Every county is divided into five districts, from each of which a county commissioner is elected. Other county officers are: a clerk of the circuit court, sheriff, county assessor of taxes, tax collector, county treasurer, superintendent of public instruction, and a county surveyor. The term of office of all the above is four years, except that of the assessor of taxes, county tax collector, and county treasurer, who are elected for two years. The Legislature provides a uniform system of municipal government. The legal rate of interest is 8 per cent., but 10 is allowed by contract. Judgments outlaw in twenty years, notes in five, and open accounts in two. Extreme cruelty, habitual intemperance, and willful neglect for one year are the principal causes for divorce—previous residence required, two years. The property of the wife is not liable for the debts of the husband without her consent. Upon the application of one-fourth of the electors of any county a vote can be taken to determine whether intoxicating liquors shall be sold in the county.

MILITIA. In 1899 the organized aggregate militia of Florida was 1258, of whom 1167 were members of the infantry and 91 of the light batteries. In 1900 the males of military age numbered 114,500.

Tallahassee is the capital of the State. Two Representatives are sent to the Lower House of Congress.

HISTORY. Florida was discovered on Easter Sunday (*Pascua Florida*), 1512, by Ponce de Leon, who landed near the site of the present Saint Augustine in search of the Fountain of Perpetual Youth. He failed to find the fountain, and, returning in 1521, found death instead. Ayllon carried off large numbers of Indians from Florida as slaves between 1520 and 1526, and in 1528 Pánfilo Narvaez (q.v.) invaded the country with a force of 400 men eager for conquest and booty. Narvaez pushed into the wilderness north of the Gulf, and only four survivors of his band, among them Cabeza de Vaca, succeeded in reaching Mexico after infinite hardships. In 1539 Hernando De Soto (q.v.) traversed the country. In 1559 a well-equipped expedition of 1500 men under Don Tristan de Luna sailed from Vera Cruz, and landed, August 14, on the shores of Santa Maria Bay, probably the Bay of Pensacola. The main body penetrated into the country for a distance of forty days' march, while a smaller detachment explored the region as far as the Coosa River in eastern Alabama. Discouraged by the hardships encountered, the expedition returned to Mexico, after passing more than a year in the country.

Under the patronage of Coligny, French Huguenots, led by Ribault, had founded in 1562 a colony at Port Royal, in South Carolina; when that settlement, owing to the worthless character of the colonists, failed, René de Laudonnière brought over a new band of emigrants in 1564, and built Fort Caroline on the Saint John's River. To uphold the Spanish claims to the country against the French, Pedro Menendez de Avilés sailed from Spain in 1565, erected a fort at Saint Augustine, and, taking Fort Caroline, exterminated the Huguenot colony. (See GOURGUES, DOMINIQUE DE.) Saint Augustine was burned by Sir Francis Drake in 1586, and was plundered by English buccaneers in 1665; but the Spaniards retained their hold on the country, and about 1699 founded Pensacola. In 1702 the Perdido River was made the boundary between Florida and French Louisiana. Between the Spaniards of Saint Augustine and the southern English colonists hostile relations generally prevailed. A force from Carolina, under Colonel Daniel, burned Saint Augustine in 1702, and in the following year Governor Moore, with a force of English and Creek Indians, defeated a Spanish force under Don Juan Mexia at Fort San Luis, near Tallahassee, and reduced a number of Spanish-Indian towns. In 1718 and again in 1719 Pensacola was taken by the French, the town being destroyed on the second occasion. When Georgia was settled, General Oglethorpe found it necessary to protect the new colony by an invasion of the enemy's country. He failed to take Saint Augustine, but repelled an attack of the Spanish fleet on the forts of the Altamaha in 1742. By the Treaty of Paris in 1763, Spain ceded East and West Florida (the latter lay west of the Apalachicola River, and embraced a large part of what is now Alabama and Mississippi) to England, but recovered possession of both in 1783. West Florida was sold to France in 1795. After 1803 the United States asserted its title to the region between the Pearl River and the Perdido on the ground that it had formed part of Louisiana as held by France, Spain, and France again, in turn. In 1812 and 1813 United States troops took possession of the disputed territory. Pensacola was garrisoned by the British in 1814 with the consent of the Spanish authorities, but was taken by General Jackson in November of that year.

In East Florida Spain made no attempt to preserve order, and the country was overrun by white adventurers, Seminole Indians, and escaped slaves from the Southern States. Marauding bands of Indians and negroes crossed the frontier into Georgia, plundered and burned, and fled into Spanish territory beyond the reach of the United States authorities. Such reasons, as well as a natural hunger for land, made the Georgians anxious for the acquisiton of the peninsula. In 1818 General Jackson, conducting operations against the Seminoles, invaded Florida, and after defeating the Indians, turned about and took Pensacola, the Governor of which had been supplying the Seminoles with arms. The town was restored to Spain; but in 1821 Florida, by virtue of a treaty concluded in 1819, passed to the United States, and in March, 1822, it was organized into a Territory. It was admitted into the Union in 1845. Between 1835 and 1843 a bitter warfare was waged against the Seminoles, and it resulted in the removal of the greater part of them beyond the Mississippi. On January 10, 1861, the State passed an ordinance of secession. Three days previously the State authorities had seized Fort Marion and the arsenals at Saint Augustine and Apalachicola; and on the 12th the navy yards and forts at Pensacola were taken possession of. Jacksonville, Fernandina, and Saint Augustine were taken by the Federal forces in 1862; but at the battle of Olustee, February 20, 1864, the State was lost to the Union. The ordinance of secession was repealed in October, 1865, and a State Government was organized in 1866; but it was not till June, 1868, after a new constitution had been adopted and the Fourteenth Amendment ratified, that Florida was readmitted into the Union. For a number of years after the war, the State was in difficult financial conditions, and the burden of taxation was heavy. Elaborate plans for the building of new railroads failed to be carried out, and many old roads went into bankruptcy. Between 1875 and 1880, a period during which the political power was passing from the Republicans to the Democrats, election contests were close and bitter, and appeals from the ballot-box to the courts were frequent. The part played by the electoral vote of Florida in the disputed Presidential election of 1876 was important. (See ELECTORAL COMMISSION.) After 1882 the reclamation of swamp lands in the south of the peninsula was carried on on a large scale, and led to the development of the sugar industry. The discovery of rich phosphate deposits in 1889 improved economic conditions greatly, and the growing popularity of eastern Florida as a winter resort has further enhanced its prosperity. The present Constitution was adopted in 1886. In politics, both State and National, Florida since 1876 has been invariably Democratic.

TERRITORIAL GOVERNORS

Andrew Jackson	1821–22
William P. Duval	1822–34
John H. Eaton	1834–36
Richard K. Call	1836–39
Robert R. Reid	1839–41
Richard K. Call	1841–44
John Branch	1844–45

STATE GOVERNORS

William D. Moseley	Whig	1845–49
Thomas Brown	"	1849–53
James E. Broome	Democrat	1853–57
Madison S. Perry	"	1857–61
John Milton	"	1861–65
William Marvin	Provisional	1865–66
David Shelby Walker	Democrat	1866–68
Harrison Reed	Republican	1868–72
Ossian B. Hart	"	1873–March 1874
Marcellus L. Stearns	"	1874–77
George F. Drew	Democrat	1877–81
William D. Bloxham	"	1881–85
Edward A. Perry	"	1885–89
Francis P. Fleming	"	1889–93
Henry L. Mitchell	"	1893–97
William D. Bloxham	"	1897–1901
William S. Jennings	"	1901–

Consult: Mrs. Stowe, *Palmetto Leaves* (Boston, 1873); Barbour, *Florida* (New York, 1884); Norton, *A Handbook of Florida* (New York, 1892); Cory, *Hunting and Fishing in Florida* (Boston, 1896); Ward, *The English Angler in Florida* (London, 1898); Bush, "History of Education in Florida," *United States Bureau of Education, Circular of Information*, 1888, No. 7; Fairbanks, *History of Florida* (Philadelphia, 1871).

FLORIDA. The first of the Confederate privateering vessels, built at Liverpool by Laird, a member of Parliament. She sailed from Liverpool in March, 1862, under the name of the *Oreto;* was equipped at Nassau, Bahamas, with an armament of two seven-inch and six six-inch guns, and in September ran the blockade into Mobile Harbor. On January 6, 1863, she ran out as the *Florida.* In the Brazilian port of Bahia she was captured by the *Wachusett*, under Capt. Napoleon Collins (October 7, 1864). Her seizure was a violation of the neutrality laws, and gave rise to much excitement. The *Florida* was taken to Hampton Roads, where she was sunk not long after.

FLORIDA AGRICULTURAL COLLEGE. An educational institution organized at Lake City, Fla., in 1884 under the Congressional act of 1862, granting lands to the several States for the establishment of colleges of agriculture and mechanic arts. From this act and from a further act of 1890, the college receives an income of about $21,000. In addition, the 'Hatch Bill' of 1887 permits the maintenance of an agricultural experiment station. The college offers courses leading to the degrees of B.A. and of B.S. in agriculture, chemistry, engineering, and literature. Women are admitted on equal terms with men. The student enrollment is about 200.

FLORIDA-BLANCA, flô-rē′ᴅȧ blän̲′kȧ, JOSÉ MOÑINO, Count of (1728-1808). A Spanish statesman. He was born in Murcia, was educated for the law at Salamanca, and became the principal prosecuting official to the Council of Castile. In this capacity he was the author of the decree for the expulsion of the Jesuits, in 1767, and in 1772 he was sent by the Marquis Esquilache, the Prime Minister, on a mission to Rome to confer with Pope Clement XIV., and was created Count of Florida-Blanca on his return to Spain. In 1777 he succeeded Grimaldi as Minister of Foreign Affairs, and also became president of the Council of Ministers. Florida-Blanca's long ministerial career, lasting from 1777 to 1792, was one of the most brilliant and successful in Spanish history. In foreign affairs his administration, although not so completely successful, was marked by true statesmanship. He is said by some writers to have suggested the famous 'Armed Neutrality' (q.v.) in 1780, and it was during his administration of the Foreign Office that Spain joined with France, in accordance with the provisions of the Family Compact of 1761, in the war against England, though Florida-Blanca steadfastly opposed any recognition of American independence. A treaty was negotiated with the Sultan of Turkey, and Algiers bombarded, and the Algerine pirates were brought to terms. On the accession of Charles IV., in December, 1788, Florida-Blanca sought to retire from his position, but at the urgent request of the King retained his office three years longer. In 1792 an intrigue at Court resulted in his retirement and the elevation of Aranda. Absurd and unsubstantiated charges of the malversation of funds were brought against him, and he was imprisoned for a short time in the fortress of Pamplona. On the fall of Aranda, and the appointment of Godoy as Prime Minister, he was set at liberty, and restored to his rank and honors, after which he retired to his estates in Murcia. There he remained quietly until the Napoleonic invasion of 1808, when he was chosen president of the Central Junta of the Government, but died soon afterwards.

FLORIDA, CAPE. See CAPE FLORIDA.

FLORIDA, GULF OF. See FLORIDA STRAITS.

FLORIDA JAY. See JAY.

FLORIDA STRAITS (also called the New Bahama Channel, and the Gulf of Florida). The coast waters separating southeast Florida and the Florida Keys from the Bahamas and Cuba, and traversed by the Gulf Stream (Map: Florida, C 5). The total length of the straits is over 300 miles, and the width varies from 100 miles to 60 miles. The depth of the main channel is about 3000 feet, but the eastern half of the straits includes the shallow waters of the Great Bahama Bank.

FLORIDIA, flô-rē′dê-å. A city in Sicily, seven miles west of Syracuse, in the midst of vineyards, olive groves, and fields of grain. (Map: Italy, K 10.) Population, in 1901, 12,165.

FLORIDSDORF, flô′rêdz-dôrf. A suburban municipality, three miles north of Vienna, the capital of a district of the same name. It is an important industrial centre, with extensive distilleries and manufactures of machinery and locomotives. Floridsdorf was a small town of 6000 inhabitants prior to 1896, when in that year it was made the government seat of a district, and its municipal area extended to embrace several adjacent villages. Population, in 1900, 36,599.

FLOR′IMEL. (1) A character representing the beauty of ideal womanhood, in Spenser's *Faerie Queene*. She loves Marinel without return and is the victim of a wicked double of herself, made of snow mixed with mercury and virgin wax. Finally the evil snow image melts, and the unrequiting lover becomes conscious of her charms. As proof of her virtue she has the girdle which Venus lost when seduced by Mars, and which may be worn only by a chaste woman.

(2) The virtuous heroine of Fletcher and Rowley's *Maid of the Mill*, who, when abducted by a lover she has scorned, affects so broad a manner as to disgust him.

(3) A coquettish maid of honor in Dryden's *The Maiden Queen*. The role has become famous through its association with the successes of Nell Gwyn.

FLORIN (OF., Fr. *florin*, from It. *fiorino*, from *fiore*, Lat. *flos*, flower; associated by popular etymology with It. *Fiorenza*, Florence, from Lat. *florere*, to bloom, from *flos*, flower). The name of a gold coin first struck in Florence (q.v.) in the thirteenth century. It was of the size of a ducat, and had on the obverse a lily, and on the reverse the head of Saint John the Baptist. These coins were soon imitated all over Europe. It was out of them that the German gold guldens of the Middle Ages and the modern silver guldens arose. These last were to the end marked by the letters *Fl.* The gulden, or florin, was until recently the unit of account in Austria, and had a value of about $0.40. Till 1875 a florin or gulden of $0.35 was the unit in the South German States. The Dutch florin or gulden is worth $0.40. The English two-shilling piece, called a florin, is worth about $0.50.

FLORIN′DA. In the legendary account of the conquest of Spain by the Arabs, the daughter of Count Julian, Governor of Andalusia, seduced by Roderic, last of the Gothic kings of Spain. In revenge her father invited the Saracens into Spain, and brought about the fall of the Visigothic kingdom (711).

FLORIN′IANS. A Gnostic sect, of the second century, so called from a Roman presbyter, Florinus, who introduced doctrines resembling those of the Valentinians (q.v.) into Rome in the latter part of the second century. See GNOSTICS; VALENTINIANS.

FLO′RIO, CARYL (1843—). The pen-name of William James Robjohn, an American musician. He was born in Tavistock, England, and was self-taught. In 1857 he went to New York City, where in the following year he was admitted to the choir of Trinity Church. He was associated with Trinity Church as chorister until 1860. After that he sang on the stage, and was organist in several churches. He also conducted opera in Havana, and at the Academy of Music, New York, and was director of the Amicitia Orchestra, and of several other instrumental and choral societies. His compositions include the three operettas *Inferno* (1871), *Les tours de Mercure* (1872), and *Suzanne* (1876); two operas, *Gulda* (1879) and *Uncle Tom* (1882); and several cantatas, overtures, and symphonies, as well as chamber music, and sacred compositions.

FLORIO, JOHN (1553-1625). An English author, son of a Florentine Protestant, who fled to England; taught Italian at Oxford and London, the Earl of Southampton (Shakespeare's friend), and Queen Anne being among his pupils; was appointed Groom of the Privy Chamber (1604), and passed the last five years of his life at Fulham. He died in 1625. He is author of the well-known Italian-English dictionary, *A World of Words* (1598), and an excellent translation of Montaigne's essays (1603; reprinted by J. H. McCarthy, London, 1889).

FLORIPES, flô′rêp′. The sister of Fierabras, in the Carolingian cycle of romances. She is married to Guy, Charlemagne's nephew.

FLO′RIPON′DIO. See THORN-APPLE.

FLORIS, flō′rês, FRANS (properly de Vriendt) (c.1517-70). A Flemish painter, born in Antwerp. He studied sculpture under his father, Cornelius, and painting at Liège under Lambert Lombard. Probably directed by that master, he went to Rome, and studied the drawings of Michelangelo, and there he met the historian Vasari, who called him 'the Raphael of the Low Countries.' He returned to Antwerp, and set up a school about 1540, which is said to have furnished instruction to 120 pupils. His most characteristic pictures are "The Last Judgment," in the Brussels Museum; "Lot and His Daughters," in the Dresden Gallery; and "The Fall of the Rebellious Angel," in the Antwerp Museum. His admiration and study of Michelangelo are plainly to be seen in the complicated attitudes of his figures, which are boldly conceived; but taken as a whole his works are artificial and mannered. The most important of his portraits, which are better than his other subjects, is "The Falconer" (Museum of Brunswick). His greatest pupil was Simon de Vosc.

FLORISMART, flȯ′rês-märt. One of Charlemagne's peers, a friend of Roland, in the Carolingian cycle of romances.

FLORIS′TICS (from Lat. *flos*, flower). The division of phytogeography which treats of plant distribution from the standpoint of classification (taxonomy), rather than from the standpoint of environment (ecology). See Distribution of Plants; Ecology; Taxonomy.

FLOR′IZEL. The Prince of Bohemia, in Shakespeare's *Winter's Tale.* He finds Perdita, the daughter of his father's enemy, living near the palace as a shepherdess, and falls in love with her.

FLORIZEL, or **FLORISEL, DE NIQUEA.** A supplement by Feliciano de Silva to the mediæval romance *Amadis of Gaul.* The title character is the son of Amadis of Greece and Niquea.

FLORIZEL AND PER′DITA. The name given by Garrick to his revision for the stage of Shakespeare's *Winter's Tale*, which was produced January 21, 1756, at the Drury Lane. The adapter played Leontes in the performance.

FLO′RUS. A Roman historian, who flourished in the reign of Trajan or Hadrian. He is generally, but on insufficient evidence, called L. Annæus Florus, and of his life we know absolutely nothing. He wrote an epitome of Roman history (*Epitomæ de Tito Livio Libri Duo*) from the foundation of the city to the time of Augustus. This work, which is still extant, is carefully and intelligently composed, but is disfigured by an inflated and metaphorical style. It is based, as its title shows, on the history of Livy. The best edition is by Halm (Leipzig, 1879).

FLOSS SILK (from OF. *flosche*, It. *floscia*, floss, from Lat. *fluxus*, soft, flaccid, from *fluere*, to flow). Silk fibre from the finest part of the cocoon, after all that can be reeled off has been removed. It is carded and spun, but not twisted, so that its texture is soft, downy, and lustrous. It is used chiefly for embroidery. See Silk.

FLOTATON. See Hydrostatics.

FLOTOW, flō′tȯ, Friedrich von (1812-83). A German composer of light opera. He was born at Teutendorf, Mecklenburg, the son of a minor landed nobleman. He was at first educated for the diplomatic service, but early decided to devote himself entirely to music. A period of study in composition under Reicha, at Paris, was brought to a termination by the Revolution of July, 1830; whereupon he returned to Mecklenburg, and devoted himself to composition. He was unfortunate with his earlier operas, which were refused by the managers of the important Paris theatres; but his success was compensatingly great upon the production of *Le naufrage de la Méduse, in* 1839, at the Théâtre de la Renaissance. *Le forestier, L'esclave de Camoëns, Alessandro Stradella, L'âme en peine*, were among his universally successful operas; while *Rübezahl* and *Hilda* had their greatest vogue in France and Germany. Of his compositions that have lasting value, but two are generally known: *Alessandro Stradella* and *Martha.* His operas were invariably characterized by easy and lively dramatic action, readiness of invention, facility of expression, pleasing melodies, and graceful instrumentation. In 1856 he received the appointment of intendant of the Court theatre at Schwerin, and was elected a member of the French Institute in 1864. He died at Darmstadt.

FLOTSAM. Goods cast overboard for the safety of the ship or in case of wreck and which are afterwards found afloat. The term wreck is, in the legal acceptation of the term, confined to such goods which have floated to shore. From goods in the position of wreck are distinguished those known to the law of England as *flotsam*, *jetsam*, and *ligan.* The first is where the goods continue floating on the surface of the waves; the second is where, being cast into the sea, they sink and remain under water; the third is where they are sunk in the sea, but are tied to a cork, bladder, or buoy, in order that they may be recovered. If no owner appears to claim them, goods in these various positions go to the Crown, so that by a royal grant to a man of *wrecks*, things *flotsam*, *jetsam*, or *ligan* will not pass.

The usually accepted distinction between flotsam and jetsam is that flotsam is applied to such goods as are cast out of a vessel by the force of the wind or sea, while jetsam is the term given to goods intentionally thrown overboard. As to third parties the law makes no distinction. See Admiralty; Salvage; Derelict.

FLOTTE, flȯt, or **FLOTE**, Pierre (c.1250-1302). A Chancellor of France. Little is known of him. He was born in Auvergne; was sent on important missions by the King in 1293; and was at Court in 1296. About two years afterwards he was sent to Rome to consult with the Pope on the canonization of Louis IX., and went to England as ambassador. He was in the thick of the quarrels between Philip the Fair and the Pope, and was the first layman to be Chancellor of France. He was killed at Courtrai.

FLOUNDER (Ger. *Flunder*, from ODan. *flundra*, OSwed. *flundræ*, flounder). A name for any of the many marine fishes of the family Pleuronectidæ (see Flatfish), which includes the halibut, dab, plaice, fluke, etc. The body is more or less elongate, always much compressed, and with the dorsal and anal fins extending for the greater length of the body; the scales may be absent. The flounders possess the remarkable character (unique among vertebrates) of swimming, not with the back, but with one side uppermost. The peculiarly twisted structure of the head is adapted to this mode of life, both eyes being on the same side of the head. When young the eyes, as in other fishes, are on each side of the head, and they swim erect; but as the fish grows older one eye moves to the other side, either around the edge or right through the head. The side of the body which is uppermost is normally colored, the particular coloration usually corresponding strongly to the color of the bottom on which it dwells, while the side which habitually lies downward is white or faintly colored. Flounders abound chiefly where the bottom is smooth, either sandy or muddy. The family is a very large one, including about fifty-five genera and five hundred species. They are found in all oceans, some of them living in brackish waters and even entering rivers. Some of the species grow to an enormous size—500 pounds. They are very important food-fishes. (See Fisheries.) The family is divided into three tribes, namely: (1) Hippoglossinæ, the halibuts, having a large, symmetrical mouth and the ventral fins symmetrical (see Halibut); (2) Pleuronectinæ, the flounders proper, with a smaller, unsymmetrical mouth and the ventral fins symmetrical or almost so; and (3) Psettinæ, the turbots (q.v.), having a large mouth and the ventral fins unsymmetrical.

The distinctions outlined above are not, however, very closely followed in common speech, where several species belonging technically to the first subfamily are popularly called 'flounders.' Thus the most important species of the coast of the Northern States is the summer flounder (*Paralichthys dentatus*), also called plaice, or deep-sea flounder, which may reach a length of three feet and a weight of 15 pounds, but usually is much smaller. Like the others, it is carnivorous, feeding on shrimps, crabs, small fish (which it often pursues rapidly at the surface), and even on carrion. It is most abundant on the shallow, sandy bottoms around Long Island, N. Y., where it is taken between May and October in vast quantities. Another very similar species replaces this on the southern coast, and still another in the Gulf of Mexico. The four-spotted flounder (*Paralichthys oblongus*), which has four oblong blackish spots, frequently comes to market. The 'common' or winter flounder (*Pseudopleuronectes Americanus*) is also valuable as a food-fish, and is the principal one caught north of Cape Cod; it is small and of excellent flavor, and is taken in late fall and early spring, when it approaches the shore to spawn. The best-known species of the Pacific Coast is the diamond flounder (*Hysopsetta guttulata*), brown blotched with bluish, and constantly caught for market. Several species are among the food-fishes of Alaskan waters, even along its Arctic coast. The pole flounder is a species (*Glyptocephalus cynoglossus*) of a group known as 'flukes,' and in England, where it is common and highly prized, it is called 'craig fluke.' It has been taken in great numbers by the beam-trawl off the coast of Massachusetts, and is regarded as nearly equal in flavor to the English or true sole.

Consult Goode, *Fishery Industries*, Sec. I. (Washington, 1884). See Factors of Evolution in the article EVOLUTION. See Plate of FLAT-FISH AND FLOUNDERS.

FLOUR (formerly a variant of *flower*, q.v., for etymology). The ground and bolted substance of wheat. The name is also applied to other grains when ground, as rye flour, buckwheat flour; but if the grain from which the flour is made is not specified, the unqualified term, both in common and commercial usage, means wheat flour. The comparative importance of its production is shown from the fact that of the total cereal products milled in the United States in 1900, 62 per cent. were from wheat. Corn-meal, of which 13 per cent. of the total product consisted, ranked next, the remaining 25 per cent. being divided among the other cereals. That the use of wheat flour to the exclusion of all the other grains is not due to its higher nutritive qualities is shown from the accompanying analysis:

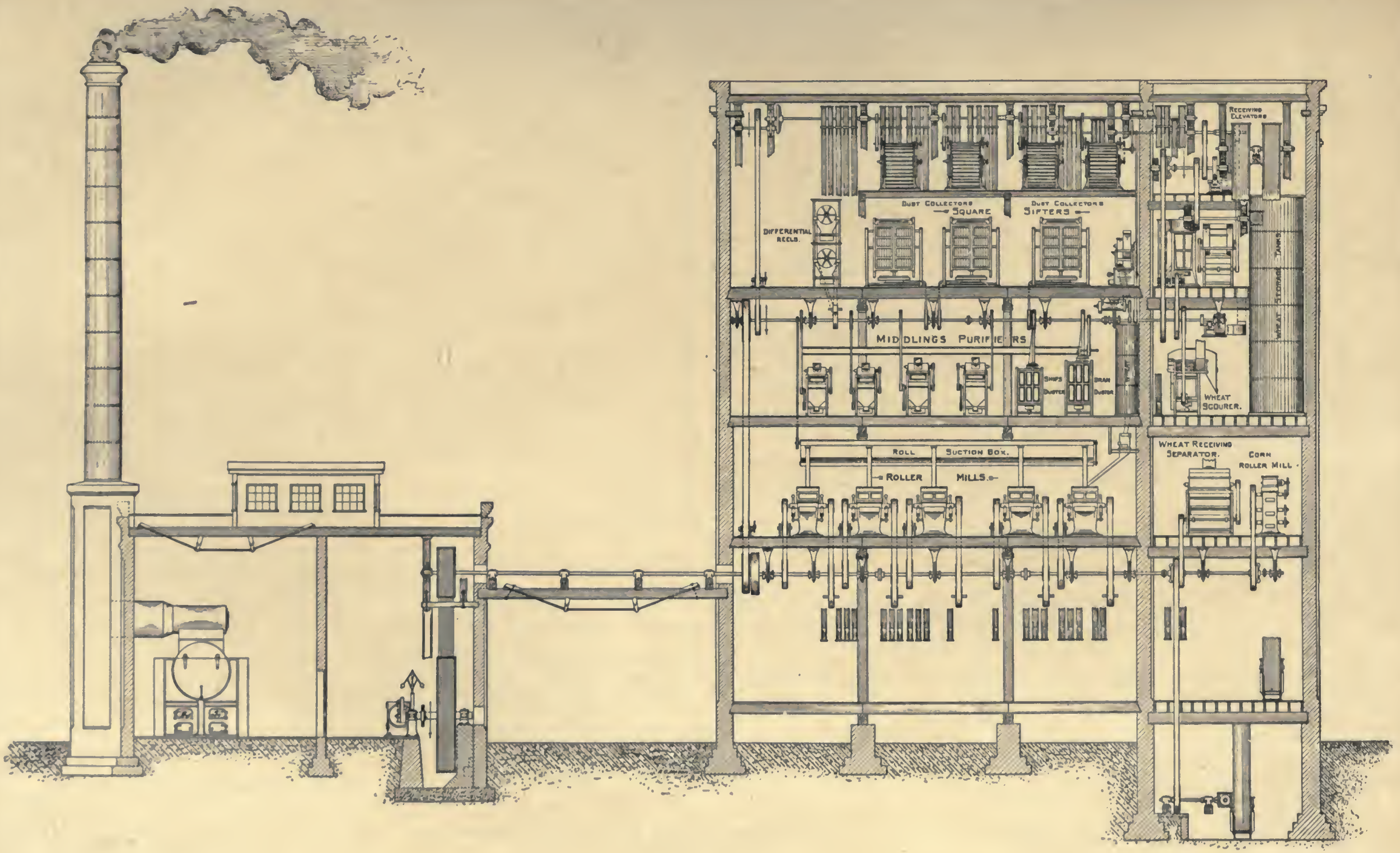
ANALYSIS OF CEREALS

From Bell's "Analysis and Adulteration of Foods"

CONSTITUENTS	Winter wheat	Spring wheat	Long-eared barley	English oats	Maize	Rye	Carolina rice
Fat	1.48	1.56	1.03	5.14	3.58	1.43	0.19
Starch	63.71	65.86	63.51	49.78	64.66	61.87	77.66
Sugar	2.57	2.24	1.34	2.36	1.94	4.30	0.38
Albumen	10.70	7.19	8.18	10.62	9.67	9.78	7.94
Nitrogenous matter	4.83	4.40	3.28	4.05	4.60	5.09	1.40
Cellulose	3.03	2.93	7.28	13.53	1.86	3.23	Traces
Mineral matter	1.60	1.74	2.32	2.66	1.35	1.85	0.28
Moisture	12.08	14.08	13.06	11.86	12.34	12.45	12.15

As pointed out in the article BREAD, the universal use of wheat flour for bread is due to the presence in the kernel of crude gluten, containing gliadin, a highly tenacious body, which is not present in the same form in other cereal flours. This adhesive or sticky quality of wheat flour enables it to retain the carbonic-acid gas inserted in the form of yeast or baking-powder, and thus produces 'lightness' in the bread. For the same reason other flours are used most successfully when combined with wheat flour. In fact, the other flours are rarely used alone for bread, except rye flour, from which the 'black bread' of Germany and northern Europe is made. This is a dark-colored, heavy, and sourish bread, very slow to dry, which is itself improved by combining wheat with the rye flour.

HISTORICAL DEVELOPMENT OF MILLING PROCESSES. Long before the dawn of history cereals formed an important article of food for the human race, especially for that portion of it inhabiting temperate climates. At first these grains were used in the wild state, without grinding or cooking. But agriculture was one of the earliest arts of civilization to be developed, and the cereals the first of the agricultural products to receive cultivation. It must have been discovered very early that both in ease of mastication and in flavor grain is much improved by grinding, so that the first milling processes came soon after the cultivation of the soil. At first a mere breaking up into coarse fragments by means of a mortar and pestle, or its substitute, was all that was attempted. This primitive form of milling, whose adoption constituted the *first step* in the art, still survives among certain peoples of rude civilization. The *second step* in the development of milling processes was taken when for the mortar and pestle were substituted two roughened grinding surfaces, placed close together, between which the grain was reduced to powder. This use of the upper and nether millstone for grinding grain also dates back to prehistoric times. An improvement over this simple device is the *quern*, or hand-mill, still used among semi-civilized peoples. In the quern the upper stone is pierced and turned on a pin on the nether stone; the upper stone is grasped by a handle consisting of a stick thrust into its edge. The use of animal and then of water power to turn the millstones came much later. The first successful steam flour-mill was erected in London in 1784. The use of millstones for grinding flour was universal until the close of the eighteenth



SIDE SECTION OF A MODERN AMERICAN FLOUR MILL
(From Plans furnished by the Nordyke and Marmon Company, Indianapolis, Ind.)

century, and is still so common, especially in small 'customs' mills, that a brief description of this process of milling is given. The millstones are made of buhr-stone, a form of silica as hard as flint but not so brittle. They are usually from four to six feet in diameter, and each consists of a number of pieces strongly cemented and bound together with iron hoops. The grinding surface of each stone is furrowed or grooved, one side of each groove being cut perpendicularly and the other side being inclined to the surface of the stone. The grooves on each stone are furrowed exactly alike: thus the sharp edges of the grooves on the one come against those on the other, and so cut the grain to pieces.

Fig. 1 shows a section of a flour-mill. The millstones are at *a*, the lower of which is firmly fixed, and the upper is made to revolve, on a shaft which passes up through the lower one, at a speed of one hundred revolutions per minute, more or less. Motion is communicated by the spur-wheel *b*, which is driven by a water-wheel or other power. The grain, previously cleaned, is supplied to the millstones by means of the hopper, *c*, connected with which there is a valve, *d*, for regulating the supply. Passing through a hole in the centre of the upper millstone, it comes in between the two, where it is ground, and thrown out on all sides by means of the centrifugal force. The millstones are, of course, inclosed, and the flour passes down through the spout, *e*, to the worm at *f*, which carries it along to elevators, *g*. These raise it up to the floor, on which the dressing-machine, *h*, is placed. This is a cylinder, which was formerly made of wire-cloth of various degrees of fineness, and consequently separated the flour into different qualities, but no part of it large enough in the openings to let through the bran, which passed out at the end. Silk is now preferred to wire-cloth for dressing the flour. Hoppers, *i*, are placed below the dressing-machine, by means of which the flour and bran are filled into sacks; No. 1 being fine flour; No. 2, seconds; and No. 3, bran.

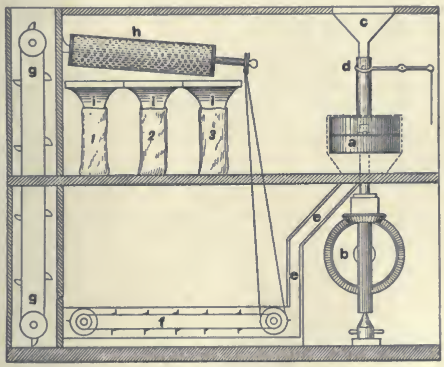


FIG. 1. OLDER FORM OF FLOUR-MILL.

The third and final step in the development of milling processes was taken when rollers were substituted for stones to perform the grinding process. Iron rollers were generally used at Pest to grind wheat before 1840, and, under the name of the Hungarian system, rapidly spread throughout Europe. As early as 1810 Ignes Paur of Austria invented a middlings purifier which is described below. It is claimed that in 1868-70 E. N. LaCroix, a French miller, independently invented a system of roller-milling similar to the Hungarian system, and installed it in one of the great flour-mills of Minneapolis. Its introduction marked an epoch in the production of American flour. The essence of this new process is the substitution for a single grinding between millstones of a succession of grindings between several sets of iron or porcelain rollers. The wheat is gradually reduced by running it through six or seven different sets of rollers, a thorough process of winnowing or sifting intervening between the grindings. As a musty odor and dark color are given to flour if it is heated during the process of manufacture, the rollers are kept cool.

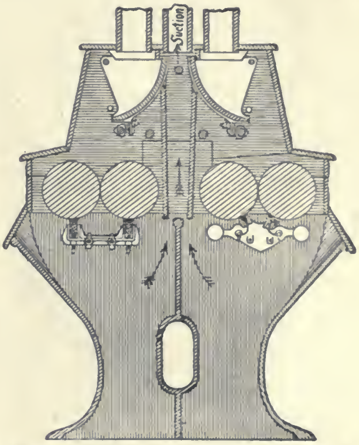


FIG. 2. SECTION OF A MODERN ROLLER MILLING MACHINE.

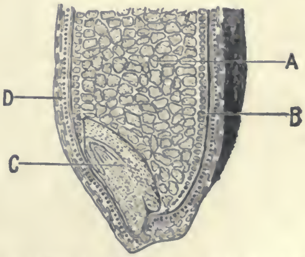


FIG. 3. MAGNIFIED SECTION OF GRAIN OF WHEAT.

Wheat is made up of a central portion of starchy cells, A in Fig. 3, surrounded by gluten cells, B, containing nitrogenous or proteid matter, which builds up tissue. The germinal portion shown at C contains phosphates, which possess great food value, as do the inner layers of the husk, D. The exterior coatings, which are of a fibrous or woody nature, are, on the other hand, quite indigestible while passing through the alimentary canal of a human being. That portion of the wheat between the central starchy portion and the husk is called the *middlings*. This is the most valuable portion of the wheat for making not only a nutritious but also a light bread.

Two grades of wheat are known to the miller: *Winter* wheat, or that sowed in the fall and coming up in the early spring; and *spring* wheat, which grows during the summer, and is harvested in the fall. The winter wheat, whose kernels are softer and more starchy, is more easily separated from the husk than the spring wheat, whose kernel is much harder and much richer in gluten. The richer the wheat, the more difficult becomes the process of separating it from the husk, because the gluten is itself the cause of the toughness. Hence winter wheat produces a much whiter flour than spring wheat when both are ground by millstones. But in order to produce a white flour from either kind of wheat a large portion of the middlings, being inseparable from the bran, is lost. Hence the problem how to save and purify the middlings is a vital one with millers. While the old process aimed to avoid middlings as entailing loss of flour, the new process seeks to produce middlings, because out of the middlings comes the high-grade flour and the gluten which gives flour its rising power is saved.

The machines called 'middlings purifiers,' for winnowing the wheat between the successive grindings, are of two general types, the *gravity* and *sieve* purifiers. In the gravity purifiers, which are used for the larger-sized grains, the middlings pass in a thin stream through a current of air produced by a revolving fan, and so regulated that the bran is blown away while the wheat, being heavier, drops down into a receptacle. The sieve is an oscillating strainer of gauze, through which a current of air passes outward, carrying off the bran, while the wheat passes through the sieve. Many of the middlings purifiers in use are quite complicated in their structure, but the general principles upon which they operate are as described above.

GRADES OF FLOUR. Three grades of process flour are on the market: High-grade patent flour, baker's flour, and low-grade flour. One hundred pounds of good wheat produces about 76 pounds of all grades, and of these 72 to 76 per cent. is high grade and 18 to 22 per cent. baker's, the remainder being low grade. The accompanying table, compiled from figures published in the *Year Book of the Department of Agriculture* (1897), shows the comparative food values contained in different grades of flour, while the ash, fibre, and water represent waste. The four flours given in the table are the high-grade patent flour, baker's flour, common market flour, and flour of small mills, the samples being procured by regular purchase in the markets of Washington:

FOOD VALUES OF DIFFERENT GRADES OF FLOUR

	High grade patent flour	Bakers' flour	Common market flour	Flour of small mills
Water	12.75	11.75	12.25	12.85
Proteids	10.50	12.30	10.20	10.30
Ether extract	1.00	1 30	1.30	1.05
Ash	.50	.60	.90*	.50
Moist gluten	26.00	34.70	24.50	26.80
Dry gluten	10.00	13.10	9.25	10.20
Carbohydrates	75.25	74.05	75.65	75.30

* And fibre.

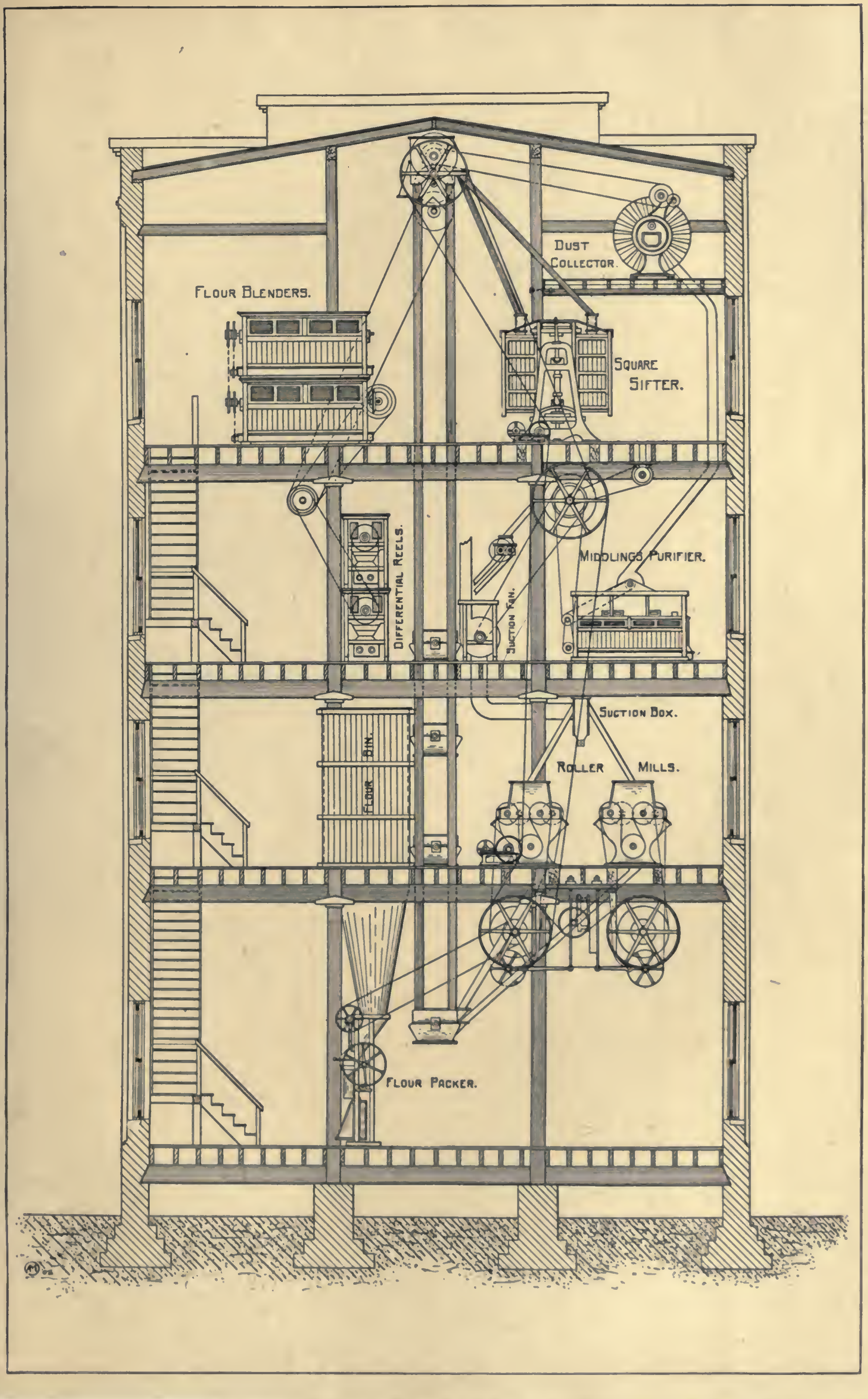
Various attempts have been made from time to time to produce a flour which should contain all the nutritive elements of the wheat, and still be palatable and digestible. Perhaps the earliest and best-known of these is *graham* flour, so called because introduced by Dr. Graham. This contains not only all the wheat, but the husk as well. It is coarse in texture, and, on account of the large amount of indigestible husk, irritating to some stomachs. Later the so-called *whole-wheat* or *entire-wheat* flours were brought upon the market, a much finer product, with more or less of the husk excluded. *Gluten* flours, from which the starch has been almost entirely excluded, have also been manufactured, and are valuable in certain forms of dyspepsia, where there is an inability to digest starch.

SELF-RAISING FLOUR. This is simply a flour into which has been mixed some chemical leavening agent, such as an ordinary baking-powder, or its constituents. This is possible, because bicarbonate of soda and tartaric acid, for instance, do not combine to produce carbonic-acid gas except in the presence of moisture. In the *Year Book of the Department of Agriculture* for 1897 analyses are given of a typical self-raising flour and of the common brands of flour, as offered for sale in open market at Washington. From these the following comparative table has been prepared:

CONSTITUENTS	Self-raising flour	High-grade patent	Bakers'
Water	12.30	12.75	11.75
Proteids (factor 6.25)	10.10	10.50	12.30
Moist gluten	27.00	26.00	34.70
Dry gluten	9.65	10.00	13.10
Ether extract	.70	1.00	1.30
Ash	4.00	.50	.60
Carbohydrates	72.90	75.25	74.99

Now, as the ash represents waste, the significant fact in this table is the relatively large amount of ash in the prepared flour, there being an excess of 3.5 per cent.

FLOUR MANUFACTURE IN THE UNITED STATES. In Colonial days large quantities of wheat were raised and converted into flour in America; but with the Hessian soldiers of the Revolution was imported the Hessian fly, a scourge which literally drove the production of wheat across the Alleghanies. Since that time the centre of wheat and flour production has steadily moved to the Northwest. In 1815 a steam flour-mill, having a capacity of 700 barrels per week, was built at Cincinnati. The first merchant mill in Minneapolis was erected in 1854. During the last half-century the importance of the latter city as a milling centre has increased so rapidly that it now ranks first in the world as a producer of flour. With the new process of flour manufacture came the era of the big flour-mill. This was due partly to the fact that the machinery involved is too complicated and expensive for the small manufacturer, and partly because this change is simply in line with modern industrial development. In the bulletin on flouring and grist-mill products of the U. S. census of 1900 a distinction is made between merchant and customs mills, and from the statistics given it is evident that milling on a small scale is still a flourishing industry. Customs mills are defined in this report as mills grinding wheat, corn, and other grain furnished from farms in the neighborhood, and are usually denominated *grist-mills*. Merchant mills are large manufacturing establishments supplying the home market, and exporting flour to the principal foreign countries. In mere numbers the customs or exchange mills constitute 59 per cent. of the total number of milling establishments. The largest number of small mills was found in Pennsylvania, and of mills of the greatest ca-



END SECTION OF A MODERN AMERICAN FLOUR MILL

(From Plans furnished by the Nordyke and Marmon Company, Indianapolis, Ind.)

pacity in Minnesota. The total number of flour- and grist-mills grinding wheat was 13,188, of which 1655 belong to the class producing less than 100 barrels per annum. The growth of the milling industry in general during the last half-century is shown by the following statistics: In 1850 there were 11,891 establishments in the United States engaged in milling cereal products; in 1900 there were 25,258 such establishments. In 1850 the capital thus invested amounted to $54,415,581, and the value of the annual product to $136,056,736; in 1900 the capital invested amounted to $218,714,104, and the annual product to $560,719,063. Of this total product, 18,699,194 barrels of wheat flour, valued at $67,760,886, were exported.

Bibliography. The history of flour manufacture in the United States is given in *One Hundred Years of American Commerce* (New York, 1895). For statistics, together with considerable historical and descriptive matter, consult the *United States Census for 1900*, vol. ix., "Manufactures," part iii. A complete description of the mechanical process of milling may be found in the "Report of the Statistics of Agriculture," *U. S. Census of 1880*, vol. iii. The chemical composition of the various cereals used as food and of the products evolved by milling, and of the final products formed therefrom by baking and other methods of preparation, are given in part ix., *Bulletin 13*, "Cereals and Cereal Products," of the Bureau of Chemistry of the United States Department of Agriculture.

FLOUR BEETLE, or Weevil. Any of several species of minute, flattened, reddish tenebrionid beetles infesting flour, meal, and all sorts of stored manufactured cereals. They may do great damage in warehouses and mills, the annual loss in the United States from this cause amounting to $100,000 or more, and constantly increasing. Our most common species are *Tribolium confusum* and *Tribolium ferrugineum*, which lay their eggs in cracks of barrels, etc., which hatch speedily into minute larvæ that feed upon the flour and then transform into pupæ. These develop into adults so rapidly that in favorably warm places several broods a year may arise. The beetles often bore holes into the wood. Nothing short of thorough scalding will efface them, but painted receptacles aid in keeping them out. Larger beetles of similar habits are called meal-worms (q.v.).

FLOURENS, flōō′räɴ′, Gustave (1838-71). A French politician and author, born in Paris. In 1863 he became deputy professor of natural history at the Collège de France, where his liberal views, particularly as expressed in a series of lectures on the history of mankind, gave offense to the clergy, who forced his resignation. He went to Belgium, and later to the East, took an important part in the Cretan insurrection, and was elected to the National Assembly of Crete, which he also represented at Athens. After his return to France in 1868, his attacks on the Empire caused his arrest (April, 1869), and upon his release from a three months' imprisonment he was wounded in a duel with the Bonapartist Paul Granier de Cassagnac (q.v.). For an attempt at armed resistance on the occasion of the arrest of Henri Rochefort (q.v.) in 1870, he was sentenced to imprisonment for three years. He escaped, however, to England, whence he returned, to become a leader of the Communist element during the siege of Paris. Upon the proclamation of the Commune (March 18, 1871), he was elected a member and appointed colonel. He was killed during the march on Versailles. He published some writings of a political character, and *Science de l'homme* (vol. i., 1865). Consult also *Souvenirs d'un philhellène; Gustave Flourens et l'insurrection crétoise de 1866-68* (Paris, 1893).

FLOURENS, Léopold Emile (1841—). A French politician, born in Paris, a brother of Gustave Flourens. He was auditor of the Imperial Council from 1863 to 1868, and in 1879 was appointed head of a department in the Ministry of Education, in which capacity he took part in all anti-clerical ordinances. In March, 1885, he became president of the departments of Legislation, Justice, and Foreign Affairs in the Government Council, and president of the Deliberative Commission on French protectorates in the Ministry of Foreign Affairs. In 1886 he became Minister of Foreign Affairs in the Goblet Cabinet, and in this capacity succeeded in peaceably adjusting the delicate affair Schnaebelé (April, 1887)—a task rendered particularly difficult by the attitude of General Boulanger, who was in favor of replying to the alleged provocation of Germany by an energetic manifesto. Flourens retained his portfolio during the Rouvier and Tirard cabinets until April, 1888. He published *Organisation judiciaire et administrative de la France et de la Belgique de 1814 à 1875* (1875), for which a prize was awarded by the Academy.

FLOURENS, Marie Jean Pierre (1794-1867). A celebrated French experimental physiologist and author, born at Maureilhan, Hérault. After having obtained his degree of doctor of medicine at Montpellier, at the age of nineteen, he proceeded to Paris. He was assistant to Cuvier in 1828-30, and in 1832 he succeeded him as professor of natural history in the Jardin du Roi. In 1833 he succeeded Dulong as perpetual secretary of the Academy of Sciences, in 1835 he became professor in the Collège de France, and in 1840 the French Academy elected him a member. He was made a peer of France by Louis Philippe in 1846. He died at Montgeron, near Paris. For more than forty years Flourens was a voluminous writer on human and comparative anatomy and physiology, on natural history, and on various special departments of the history of the natural and physical sciences. Among his most important works are *Recherches expérimentales sur les propriétés et les fonctions du système nerveux dans les animaux vertébrés* (1824), with a supplementary volume, entitled *Expériences sur le système nerveux* (1825); *Recherches sur le développement des os et des dents* (1845); *Anatomie générale de la peau et des membranes muqueuses* (1843), and his *Théorie expérimentale de la formation des os* (1847), perhaps the most celebrated of his works. Among his smaller and popular works are his *De l'instinct et de l'intelligence des animaux* (1841); *Histoire de la découverte de la circulation du sang* (1854); *De la longévité humaine, et de la quantité de vie sur le globe* (1854); and *Eloges historiques* (3 vols., 1856-62).

FLOWER (OF. *flor*, *flur*, *flour*, *fleur*, Fr. *fleur*, from Lat. *flos*, flower, from *florere*, to bloom; connected with OHG. *bluoma*, Ger. *Blume*, Goth.

blōma, Icel. *blōme,* Eng. *bloom,* Ir. *blāth,* flower, and ultimately with Lat. *folium,* Gk. φύλλον, *phyllon,* leaf). A structure developed by the higher plants only, and chiefly concerned in the production of seeds. An exact definition of a flower is very difficult, but the popular conception is clear enough for this presentation. Not all plants which produce seeds can be said to have true flowers, since the conifers and their allies no more possess true flowers than do many of the fern-plants.

Parts of Flower. The parts of an ordinary flower may be illustrated by the buttercup. In this case it is observed that four distinct members enter into the organization of the flower. The outermost set is a 'calyx,' whose individual members are the 'sepals;' the next inner set is the 'corolla,' whose individual members are the 'petals;' the 'stamens' form the third set; and the 'carpels' are in the centre. The sepals and the petals are the characteristic floral leaves, while the stamens and carpels are the spore-producing members (sporophylls). The calyx and corolla taken together are frequently spoken of as the 'perianth,' the name being specially applied in case the two are similar, as in the lily. Since the whole purpose of the flower may be said to be the production of seed, the stamens and carpels are the essential organs; without them no seed could be produced. In another sense, however, the calyx and corolla are the characteristic organs, since it is their association with the stamens and carpels which distinguishes the true flower of the highest group of plants (angiosperms).

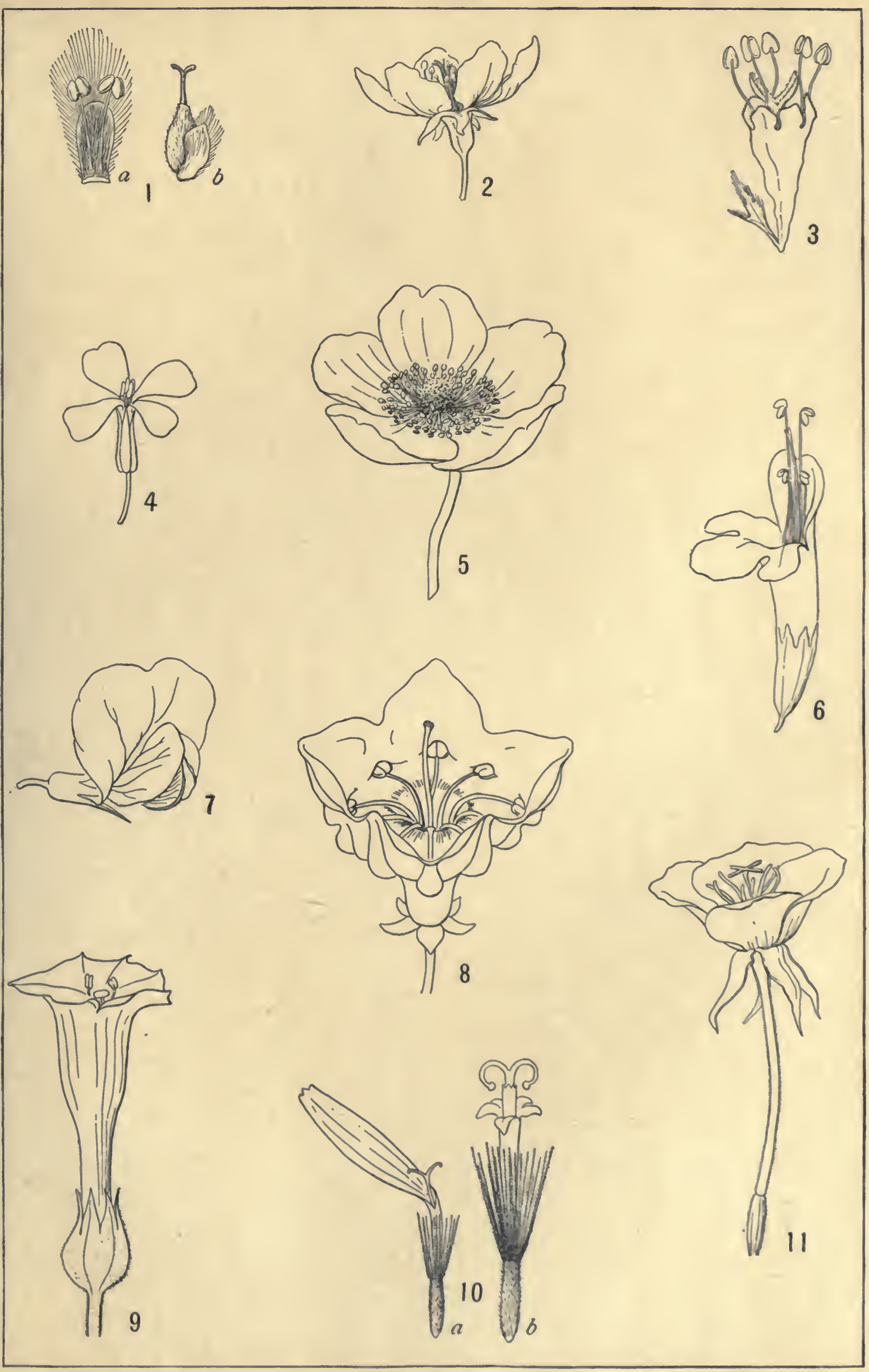
Functions of Parts. The calyx is usually merely a protective structure, being generally leaf-like or bract-like, and investing the more delicate inner members in the bud. The corolla is usually connected with pollination (q.v.), being in general the conspicuous and showy part of the flower. The stamens produce the pollen; while the carpels produce the ovules, which later become the seeds. The stamen usually has two regions, a stalk-like portion called the 'filament,' and a spore-bearing region called the 'anther.' The carpel usually has two regions, the basal part, containing the ovules, being the 'ovary,' and the more or less elongated beak-like process from it being the 'style.' The style always presents in some portion, frequently the tip, a specially prepared surface, known as the 'stigma,' for the reception of the pollen. The name 'pistil' is frequently applied to the carpel structures and is often a convenient name, although it is not an exact one. For example, each individual carpel may in certain cases be a pistil, as in the buttercup; while in other cases several carpels may have developed together as a single organ, which is also called the pistil, as in the apple. The term pistil, therefore, may be defined as any organization of carpels which appears as a single organ with one ovary.

'Type Flower' and 'Modifications.' Since the structure of the flower is so extensively used as a criterion in classification, there has come to be associated with it an enormous mass of technical terms, most of which are of no value except to the professional botanist. As the important terminology deals with the so-called 'modifications,' it will be given in connection with a description of the various relations which the floral members hold to one another. In the older morphology a so-called 'type flower' was assumed, and all variations from it were regarded as modifications of this type. This false conception in great measure has been abandoned, and flowers are recognized as having developed along many different lines from exceedingly primitive conditions. For example, the flower of the lily was once regarded as a typical monocotyledonous flower, and all simpler forms were thought to be modifications of this type. The possible transition from the flower of a lily to that of a grass has often been cited, the meaning being that a grass-flower is merely a reduced lily-flower. The present view, however, is that the simpler grass-flower is more likely to be a primitive condition than a derived one. It is impossible as yet to distinguish all the lines along which flowers have advanced, and the relations of these lines to each other. Certain prominent lines are, however, conspicuous, and may serve as illustrations. In all of this evolution of flowers the end attained seems to be a better scheme for the transfer of pollen, chiefly by means of insects, or better devices for the scattering of seeds, or both. These conspicuous paths of advance may be summarized briefly as follows:

Diversity of Flowers. In the most primitive flowers the parts have a spiral arrangement. For example, the sepals, petals, and stamens are not in definite rosettes or cycles, but appear at different levels and may be indefinitely repeated. In this case there is no such thing as definite numbers. In the more highly developed flowers, however, the spiral arrangement passes into the cyclic, in which the members of each set form a definite rosette or cycle, in which the numbers are limited. Usually these numbers are definite for great groups, the prevailing number in the cyclic monocotyledons being three and the prevailing number in the cyclic dicotyledons being five or four. One of the common causes of diversity among flowers is the absence of one or more of the four sets, or of some member or members in a single set. This may be the primitive condition of the flower, in which the given set or member is not to be expected; or it may be a case of abortion or suppression, which means that organs which are to be expected have failed to develop, although they may do so partially. As prominent illustrations of such diversities the following may be mentioned. It frequently happens that but a single set of floral leaves appears, and it is customary to regard the missing set as the petals, such flowers being called 'apetalous.' In other cases neither calyx nor corolla appears, in which case the flower is said to be 'naked.' In still other cases the stamens are lacking, and if a pistil be present the flower is said to be 'pistillate.' If the pistil is lacking and the stamens are present, the flower is 'staminate;' while if both stamens and pistils are lacking, the flowers are 'neutral.'

Other diversities arise from the fact that the members of a set may to greater or lesser degree lose their independence and develop in common, giving the appearance of coalescence. For example, the sepals may organize an urn-shaped or tubular calyx, or the petals may organize a corolla which resembles a tube, a funnel, a bell, etc. The terminology used in such cases implies that members originally separate have coalesced; but the fact is that there has been no coalescence of distinct parts, but a ring-like outgrowth instead of

FLOWERS



1. WILLOW (Salix), showing staminate (a) and pistillate (b) flowers; 2. PEAR (Pyrus); 3. ELM (Ulmus); 4. RADISH (Raphanus); 5. ANEMONE; 6. SAVORY (Satureia); 7. PEA (Pisum); 8. MOUNTAIN LAUREL (Kalmia); 9. TOBACCO (Nicotiana); 10. ARNICA, with ray (a) and disk (b) flowers; 11. EVENING PRIMROSE (Œnothera).

growth at separate points. Flowers with a corolla of this kind are said to be 'sympetalous' ('monopetalous,' 'gamopetalous'). The same tendency is shown by the stamen set; while it is exceedingly common among the carpels, in which latter case the flower is said to be 'syncarpous,' resulting in the so-called 'compound pistil.' The sympetalous character of flowers is so definitely associated with natural groups that the character gives name to the great group Sympetalæ, which is one of the two large divisions of dicotyledons. The contrasting condition of flowers, namely, the occurrence of petals entirely distinct from one another, is called 'polypetalous,' such flowers being regarded as more primitive than sympetalous flowers.

Another source of diversity in flowers is the tendency of contiguous sets to become more intimately related than usual. For example, the stamens and petals may be so intimately related to one another in origin that the former seem to arise from the latter. This condition is common in sympetalous flowers, where the stamens are said to be 'inserted upon the tube of the corolla.' This apparent coalescence of adjacent sets is frequently called 'adhesion,' a term which implies that the two sets are normally distinct, but have become adherent. Such an explanation is no more true than that which was given to the apparent coalescence of the members of a single set. This tendency of different sets to arise together, rather than separately, has resulted in three well-marked conditions. When the sepals, petals, and stamens all rise from beneath the ovary, the flower is said to be 'hypogynous,' or to have a 'superior ovary.' This is the most primitive condition. When these three outer parts arise from the rim of an urn-like outgrowth from the receptacle ('torus'), which surrounds the pistil or pistils, the flower is said to be 'perigynous.' Finally, the insertion of the outer parts may be carried above the ovary, from the summit of which the sepals, petals, and stamens seem to arise, such a flower being called 'epigynous,' or said to have an 'inferior ovary.'

Regularity and Irregularity. In the more primitive flowers the different members of a set are similar and are repeated uniformly about a common centre. Such a flower is said to be 'actinomorphic,' or 'radiate,' or more simply a 'regular flower.' In many cases, however, the members of a single set are not all alike, and this is particularly noticeable in the corolla. In the common violet, for example, one of the petals develops a spur; in the sweet pea the petals are remarkably alike; while a very common form is the bilabiate or two-lipped flower, as in the mints. Such unequal development of the members of a single set is called zygomorphism, or more commonly 'irregularity.' Double flowers result from modification of other floral parts, as stamens into pistils. When both pistillate and staminate flowers are present in the same inflorescence, they are said to be androgynous.

The arrangement of the parts of the flower in the bud is known as 'æstivation.' See Buds, and separate articles on the various parts of the flower.

FLOWER, Phillis. The heroine in Heywood's *Fair Maid of the Exchange.*

FLOWER, Roswell Pettibone (1835-99). An American capitalist and politician. He was born in Jefferson County, N. Y., where he worked on a farm and in a mill, and was clerk in a hardware store at Watertown. His ability as a financier was proved before coming to New York in 1869, where he soon became a recognized power in Wall Street, and was made director in various corporations. In 1881 he was elected by the Democratic Party to Congress, and was Governor of the State for the term of 1892-94. His many benevolences include the building in New York City of the Flower Hospital and of Saint Thomas's Home.

FLOWER, Sir William Henry (1831-99). An English anatomist, born at Stratford-upon-Avon, Warwickshire. He graduated in medicine at the University of London in 1851, and was a member of the medical service during the Crimean War. In 1861 he was appointed curator of the Hunterian Museum of the Royal College of Surgeons of England, where he also became professor of comparative anatomy and physiology in 1870. In 1884 he was chosen director of the British Museum of Natural History. From this post he retired in 1898. He was elected a fellow of the Royal Society in 1864, and from 1879 until his death was president of the Zoölogical Society of London. He was also president of the Anthropological Institute from 1883 to 1885, and at various times president of the anthropological section of the British Association for the Advancement of Science. His principal investigations have to do with the Monotremata and the marsupials, and his researches concerning the structure of the brain of lemurs and apes are also important. He was the first to show that marsupials retain throughout their life-history a permanent dentition, with the exception of one tooth, and that thus marsupials are differentiated from the other mammals. His publications, in addition to numerous memoirs, include: *Diagrams of the Nerves of the Human Body* (1861); *An Introduction to the Osteology of the Mammalia* (1870; 3d ed., revised, 1885); *The Horse* (1890); and *Essays on Museums and Other Subjects* (1898).

FLOWER AND THE LEAF, The. A poem published in the 1598 edition of Chaucer's works, but not now believed to be his. Dryden produced a not very satisfactory version of it, which was published in 1700 among his *Fables.*

FLOWER-BEETLE. Any of many small beetles seen almost exclusively on flowers, feeding on pollen. The most common flower-beetle in the Northern United States is a yellowish-brown, black-spotted species (*Euphoria inda*), which feeds not only on the pollen of all sorts of flowers, but on the stalk and ears of young Indian corn, and on various fruits, and may become a serious pest. It flies in early spring close to the ground, with a humming sound very much like that of a bumblebee, and a second brood appears in September.

FLOWER-BUG. One of a family (Anthocoridæ) of small bugs, distinguished from bedbugs by their long, oval forms, and by having wing-covers and ocelli. Not many species are known, but individuals are extremely numerous, haunting flowers, where they hunt out and devour plant-lice, lace-bugs, and similar minute pests of horticulture. Some dwell in ants' nests. The commonest species is *Triphleps insidiosus*, which, like most of the others, is shining, black and white.

FLOWER DANCE. There were two distinctively floral dances in Greece, the anthema, which was danced by women at private gatherings, and the May dance, in which the most beautiful young girls decorated themselves with flowers and danced out singing in honor of the goddess of the May. The song, which was sung while dancing the anthema, was as follows:

> "Where's my lovely parsley, say?
> My violets, roses, where are they?
> My parsley, roses, violets fair,
> Where are my flowers? Tell me where."

FLOWER-DE-LUCE. See Iris.

FLOWER OF COURTESY, The. A poem attributed to Chaucer by Thynne. The preponderance of evidence, however, points to John Lydgate as the author.

FLOWER OF KINGS, The. A title sometimes given to King Arthur.

FLOWER-PECKERS. A book-name for a rather indefinite group of small, brightly colored East Indian birds, sometimes called honey-peckers, of which the Australian dicæum is regarded as a type. They have many characteristics of the creepers, but are provisionally set apart into a family Dicæidæ.

FLOWER-POTS. Receptacles of unglazed earthenware, tapering a little toward the bottom, which is perforated with one or more holes. (See Pottery.) Those of smallest size are only about two inches deep, and are used chiefly for seedlings to be soon again transplanted. For plants which require a pot of more than 12 inches deep and 18 inches wide, wooden boxes or tubs are generally provided, although earthen pots of much larger size are sometimes made. The flower-pot is usually placed in a saucer of the same material, but when plants growing in flower-pots are placed out of doors the saucer is often dispensed with. For ornamental use flower-pots are sometimes glazed, or made in the shape of vases. In filling flower-pots, small stones or bits of broken pottery are placed in the bottom, to prevent water from lodging there and souring the soil in which the plant is to grow.

FLOWERS. A term applied by the older chemists to any light pulverulent substance obtained by sublimation, as flowers of antimony, flowers of arsenic, flowers of benzoin, flowers of sulphur, flowers of zinc, etc.

FLOWERS, Artificial. Copies of natural flowers made of a great variety of materials, and used for both scientific and decorative purposes. To the former class belong the collection of flowers in the possession of Harvard University, which are made wholly of glass, and illustrate the flora of the United States. Flowers and leaves of painted linen, and of horn shavings stained in various colors, were made by the ancient Egyptians, and it is said that Crassus of Rome made such artificial flowers of gold. The Chinese form beautiful flowers out of rice paper made from the pith of a kind of bamboo, while the natives of the Bahama Islands and other savages arrange small and daintily tinted shells into sprays of flowers. Feathers have long been made into beautiful flowers by the South American Indians. In Italy the cocoons of silkworms are dyed and used extensively for this purpose. Fine imitations of flowers are made from paper, especially crêpe paper, ribbon, velvet, and the thin laminæ of whalebone. Wax-flower making is a distinct branch of the art and is considered under a separate article. At one time the making of wreaths of flowers out of locks of hair, the gifts of friends, cleverly woven with wire, was a favorite form of fancy work among ladies. The Italians were the first to bring the art of making artificial flowers to a high state of perfection. At present the chief centres for the manufacture of flowers for the decoration of ladies' bonnets and dresses, for head-wreaths and for table and house decoration, are in France and America. French immigrants probably introduced the industry into America. As early as 1840 there were ten establishments for making artificial flowers in New York City.

The materials of which the artificial flowers commonly in use are made are silks, cambric, jaconet, and fine calico, besides muslin, crape, and gauze for particular flowers, and satin and velvet for thick petals. The tinting of petals of the best flowers requires some amount of delicacy and skill. In nature the tint of each petal of a flower is rarely uniform; and the best artificial flowers represent the natural variations with great accuracy. The petals of a rose, for example, are dyed by holding each separately by pincers, and then dipping it in a bath of carmine, and afterwards into pure water, to give delicacy of tint; but as the color is usually deepest in the centre, a little more dye is added there while the petal is still moist, and this diffuses itself outward in diminishing intensity. The whiteness at the insertion of the petal is produced by touching that part with pure water after the rest is dyed. The artificial flowers of trade, however, are colored by no such delicate means. The material of which they are made is simply dyed in uniform color, in sheets, and any variation in tint is effected by a few daubs of the paint-brush after the petals are cut out. The aniline dyeing solutions are heated by steam in great copper kettles, into which the material is dipped. The material is then passed through a wringer, and stretched upon frames to dry. The next step is to size the material by applying a solution of dextrin and starch evenly to the surface, while the cloth is still stretched upon the drying-frames. The material is now ready to be cut into the leaves or petals of flowers. This is effected by sharp steel cutters, made of the desirable size and shape. A large stock of these irons is necessary, as special forms and sizes are required for each flower. Ten or twelve sheets of the material of the same color are carefully and smoothly laid in a pile on a leaden block, and the cutter, with a wooden mallet, drives the sharp steel stamp through the pile and repeats the process till the sheets are riddled with holes. The leaves and petals are now passed on to another workman, who presses the veins into them by means of a pair of dies. (See Dies and Die-Sinking.) A petal is placed in the lower die and the upper die fitted over it. The dies are placed under a press and a turn of the wheel presses the vein-lines into the stiff material.

The next process in shaping is that of 'goffering,' or 'gauffing,' by means of which the hollow form is given to petals. For hollowing petals, the goffering-iron is simply a polished iron ball, mounted on an iron wire in a handle. It is heated and waxed, the petal is placed on a cushion, and the iron pressed against it. A variety of other forms of goffering-irons are used, such as prismatic rods and bent wires.

The stamens are made of coarse yellow thread on which corn-meal is gummed. The centres of daisies are usually of wool and cotton dyed yellow. Flowers are put together wholly by hand, and are built up from the centre; the pistils and stamens are tied in a bunch to a piece of wire; the petals are arranged in order, and pasted; then the sepals of the calyx are pasted outside of these, and further secured by winding fine thread or silk round the lower parts. Other wires are inclosed with this thread, and form the stalk, which is bound round with green tissue paper; and at proper intervals the leaves are inserted by means of fine wires, to which they are bound, the ends of these wires being bound in and incorporated with the stalk, and concealed by the green paper, or a green rubber tubing may be used for the stems. Buds are made of taffeta, tinted, and stiffened, and stuffed with cotton. When a variation of tint is desired on a petal it is colored with a brush. The petals are taken directly from the cutter to the artist, who performs his work with great deftness and rapidity. Twenty or thirty petals are spread out on a tray, and the artist touches up one after another with the paint prepared for the purpose.

Besides the flowers copied from nature, there is a considerable demand for what are called 'fancy flowers,' most of which are invented by the manufacturer to use up waste and spoiled fragments originally designed for better purposes. Flowers suitable for mourning are prepared by coating leaves, flowers, etc., with strong gum, and then dusting upon them powdered galena. This substance, a sulphuret of lead, is formed naturally in lustrous cubic crystals of a dark-gray color, and however finely it is powdered, the fragments still tend to retain the same shape and surface, and thus present a number of flat glittering facets. It is used in like manner for cheap jewelry.

FLOWERS, Language of, or Florigraphy. The language of flowers is supposed to have been used among the earliest nations; but the Greeks are the first users of whom we have any trustworthy records. They carried it to a very high degree, using flowers as types of everything interesting, public as well as private. The Romans also had a well-developed flower language, and its study was revived during the Middle Ages, when chivalry became preëminent; and it received great development at the hands of the Roman Church. Flowers have had an important part in all mythologies. Oak was the patriot's crown, bay the poet's, and the myrtle the crown for beauty. The olive was the token of peace, as the ivy was the emblem of Bacchus. The significance of many flowers is derived from their properties. The amaranth has been selected to typify immortality because of its duration. The rose, by universal suffrage made the the queen of the flowers, has a symbolism varying with its color; a single red rose signifies 'I love you;' the small white bridal rose typifies happy love; and the moss-rose bud, a confession of love. The following are some well-known flowers, with their symbolism as used in poetry:

Anemone—Frailty, anticipation.
Apple-blossom—Preference.
Buttercups—Riches.
Calla—Magnificent beauty.
Candytuft—Indifference.
Cowslip—Youthful beauty.
Daffodil—Unrequited love.
Dandelion—Coquetry.
Forget-me-not—True love.
Foxglove—Insincerity.
Geranium—Deceit.
Gentian—Virgin pride.
Goldenrod — Encouragement.
Heliotrope—Devotion.
Honeysuckle—Fidelity.
Hyacinth—Sorrow.
Lilac—Fastidiousness.
Marigold—Contempt.
Lily—Majesty, purity.
Narcissus—Self-love.
Pansy—Thoughts.
Poppy—Oblivion.
Snow-drop—Friend in need.
Sweet-William—Gallantry.
White Violet—Modesty.

FLOWERS, National and Symbolical. The use of flowers as symbols began in very early times, and has continued to the present day among nearly all nations. Biblical literature contains many allusions to floral symbols, and China once possessed a complete floral alphabet. At the present day the Chinese make a lavish use of flowers in many of their public and religious ceremonies, on occasions of marriage, death, and burial, as well as in the decoration of the temples of their deities, the graves of their dead, and their private dwellings.

The monuments of Egypt and Assyria also have upon their surfaces a code of floral caligraphy whose meaning can now be but dimly guessed. Here the sacred lily, or lotus, of Egypt plays a prominent part. It was consecrated to the gods, and became in time the national emblem. The Egyptian deity Osiris (q.v.) is portrayed with his head crowned with this blossom; it is painted on the walls and carved on the doors of the temples.

India had in her magnificent flora a wonderful field for poetical genius. The lotus was here, and is now, the sacred flower. In its bosom Brahma was believed to have been born; and it is to the Hindus the chariot of their Cupid, whom they picture as first seen pinioned with flowers and floating down the sacred Ganges upon it. The lotus became, through its association with religious rites, an emblem of mystery, and was hence frequently used for architectural adornment. Among the Hindus distinguished strangers are welcomed with garlands of flowers as tokens of hospitality, and the shrines of their favorite deities are decorated with these emblems.

In Persia a yearly festival is held called the 'feast of roses,' which lasts as long as the roses bloom. The literatures and languages of the Hindu, Turkish, Persian, Arabic, and Malay races abound in floral symbols. In Japan the lotus is a symbol of purity. The Japanese picture their deity reclining upon the leaf of a water-lily, or lotus, and often name their children after beautiful flowers. The chrysanthemum, or 'golden flower,' is the national emblem, and the country is popularly called the 'Land of Chrysanthemums,' and a day is yearly set apart in that country for the 'festival of chrysanthemums.' From early days there have been two royal crests in Japan; one is the paulownia-tree, which is seen only on the seals of the Emperor's family; the other, the chrysanthemum, which is used for all governmental symbols outside the palace. The flower is embroidered on their flags and banners, and printed on important papers. It is stamped on their silks and has decorated their finest porcelain for hundreds of years.

European florigraphy had its rise in Greece, and many of the old floral customs still linger about the Grecian islands. The Greeks not only seem to have entertained the most passionate love for flowers, but to have adopted them as typical of every interesting occurrence, public or private. Wooers decorated the doorways of their beloved ones with garlands of flowers; the illness of the inmates was indicated by buckthorn and laurel hung across the lintels; while at death, parsley was sprinkled over the remains, and the head was crowned with various symbolical flowers. At the public games of Greece the victor was invariably rewarded with some floral emblem. The Olympian winner received a garland of wild olive (see OLIVE); the Pythian victor received a laurel crown. In the Nemæan games, a crown of parsley was awarded; in the Elean, a crown of pine-leaves. The youths crowned themselves with flowers in the fêtes, the priests in religious ceremonies, and the guests in convivial meetings. Garlands of flowers were suspended from the gates of the city in times of rejoicing. The conventional epithet of Athens was 'the city of the violet crown,' the violet being chosen as the national emblem.

The highest honor that a Roman soldier could receive was the civic crown made of oak-leaves. The Latins instituted a festival in honor of Flora in B.C. 736, according to tradition, during the reign of Romulus; but the public games, or *Floralia*, were not regularly established until B.C. 173, when it was ordained that the feast should be annually kept on the 28th day of April, lasting five days. Among the Latins, as among the Greeks, flowers were used as symbols on all public occasions. At marriages the bride wore a wreath; the doorposts of the bridegroom's house were adorned with flowers, birth was heralded by them, and the bier of the dead was strewn with them.

In the Iberian peninsula floral symbolism is principally indebted to Roman Catholic legends for the little vitality it there possesses. When Moorish power in Spain had been crushed, and Ferdinand and Isabella entered Granada, the pomegranate, the device of Granada, was emblazoned on the arms of Spain, and became the national emblem. In France the language of flowers has many votaries, and a lavish use is made of flowers in public ceremonies, and as a means of expressing various sentiments. The authentic use of the *fleur-de-lis* as the national emblem of France dates from King Louis VII. When setting out on his crusade to the Holy Land he chose this flower for his badge. The French flag had at first a cluster of the *fleur-de-lis* upon its face, but they were replaced by Henry IV. with the single *fleur-de-lis* on a blue ground, which was the design on the old French flag. This flower is seen carved upon the royal palaces and public buildings of the French, woven in their tapestries, engraved upon their plate, and stamped upon their wares. Napoleon I. upon becoming Emperor of France changed the emblem to the bee, but the lily was afterwards restored. The violet was also adopted as the badge of the Bonapartists in France after the banishment of their leader to Elba; its signification being, 'to return in spring.' Flowers have not seldom been used as the badges of partisans in other countries; thus in the long struggle between the Imperialists and the Pope during the twelfth century, the white lily was the party badge of the Ghibellines, while the Guelphs wore the red lily. See GUELPHS AND GHIBELLINES.

The cornflower, or *Kaiserblume*, may be considered the national flower of Germany. When Louise, the mother of Emperor William I., was forced to take refuge with her small family in the outskirts of the city of Berlin while Napoleon's army was occupying the city, the children cried from hunger and exposure. In order to pacify them the beloved queen-mother gathered the cornflowers growing by the wayside and wove them into garlands; from that time this blossom was the favorite flower of William and his people.

The national emblem of England, the rose, is of historic interest. Edward I. wore the red rose, as did his brother Edmund Crouchback of Lancaster. John of Gaunt took a red rose on his marriage with Blanche, heiress of Lancaster; and his younger brother, Edmund Langley, Duke of York, adopted the white, which he handed down to his descendants. The war known as the 'War of the Roses' afterwards waged between Henry VI. of Lancaster and Edward IV. of York, for possession of the crown of England, gave a deeper significance to these badges; but the marriage of Henry VII. of Lancaster with Elizabeth of York, eldest daughter of Edward IV., united forever the rival houses and ended the civil war. The two roses then became united under the title of the Tudor Rose, which was made the national flower. The rose has been termed the 'flower of flowers.' The ancients regarded it as the emblem of silence, of love and of joy. Cupid was frequently represented as offering a rose to Harpocrates, the god of silence. On festal occasions a rose was suspended over the table, intimating to the assembled guests that the conversation was to be literally as well as metaphorically *sub rosa*, or 'under the rose.'

In the reign of Malcolm II. of Scotland (1010), the country was invaded by the Danes, who attempted to storm an important fortress on the most eastern point of Scotland. Their preparations being completed, and the night well advanced, they approached the castle stealthily, removing their shoes. Upon reaching the moat they plunged in, expecting to swim across. Suddenly the air resounded with cries of rage and distress; for the moat, instead of water, was filled with thistles. Thus the inmates were aroused to a sense of their danger and Scotland was saved. Out of gratitude for their escape the Scots adopted the thistle as their national emblem, with the appropriate motto, *Nemo me impune lacessit.*

Saint Patrick, the patron saint of Ireland, while preaching one day was at a loss to explain the doctrine of the Trinity. The people failed to understand, and refused to believe that "there could be three Gods and yet one." The preacher paused, and stooping, gathered a shamrock growing at his feet. "Do you not see," said he, "in this wild flower how three leaves are united on one stalk, and will you not then believe what I tell you, that there are indeed three persons and yet one God?" By this simple means his audience comprehended his meaning, and at once embraced the doctrine. From that time this flower became the national emblem of Ireland.

It is recorded that on Saint David's Day, March 1, A.D. 640, the Welsh, under Caedwalla, were about to march against an English army. To distinguish each other from the enemy, they adopted the badges most easily obtained; each man plucked a leek from the field through which he was passing and stuck it in his cap. The Welsh arms were victorious, and the leek was adopted as their national emblem in grateful memory of this event. It is worn by loyal Welshmen on every anniversary of Saint David's Day.

Mexico has chosen the nopal cactus, or prickly pear, as her national emblem. The design on the Mexican coat-of-arms is an eagle perched upon a cactus stem. It is said that after the Aztecs had wandered for many years, a wise man told them that when they reached a place where they found an eagle perched upon a rock, there they should build their city. As they drew near Lake Tezcuco, they saw an eagle perched upon a branch of the nopal growing out of a rock. Here they built their city, giving it a name meaning 'Nopal on a stone.' Their coat-of-arms bears an eagle perched upon a nopal holding a serpent in its beak.

In England, ever since the death of Lord Beaconsfield (1881), the primrose has been adopted as the badge of the Conservative Party, in the belief that it was the favorite flower of their great leader. This belief is said to be a mistaken one, and to have originated in an incident that happened at the time of his funeral. The Queen sent a mass of primroses on that occasion with the inscription, "His favorite flower," meaning her own husband, Prince Albert. It was, however, understood as referring to Lord Beaconsfield, so that on the anniversary of his death (April 19th) every Conservative now wears a bunch of primroses, and the day is known as Primrose Day. See PRIMROSE LEAGUE.

The United States cannot be said to have a generally accepted national flower. In 1889 an attempt was made to secure a general expression of opinion in favor of some one flower, and the goldenrod, as being indigenous and more widely distributed than in any other country, received the majority of the suffrages; but a national flower is usually recognized only when tradition and legend give it significance, and not because of a popular vote. By acts of the Legislature some States have adopted State flowers: Iowa, the wild rose; Maine, pine cone and tassel; Michigan, apple-blossom; Montana, bitter-root; Nebraska, goldenrod; Oregon, Oregon grape; Vermont, red clover; Colorado, white and blue columbine; Oklahoma, mistletoe; Utah, sego lily. In other States flowers have been selected by vote of the school-children, or for other reasons are popularly recognized: California, the California poppy; Idaho, syringa; Kansas, sunflower; Minnesota, moccasin-flower; Nevada, sage-brush; Washington, rhododendron; Georgia, Cherokee rose; New York, goldenrod. Consult Folkard, *Plant Lore* (London, 1884).

FLOWERS AND INSECTS. The dependence of insect life on that of plants is illustrated by the fact that in Germany between 500 and 600 species of insects obtain their livelihood by feeding upon the oak, while in the United States nearly the same number of species have already been found to prey on the native oaks. The elm, willows, and pines also afford food and shelter to hundreds of species, the insect pests of the apple and other fruit trees also amounting to many hundred species each. Some insects bore in the roots; multitudes of borers penetrate into the trunk, branches, and twigs, as well as bark; while still greater numbers of caterpillars feed upon the leaves. The result of the life within the tree—in the wood or bark, or of mining the leaves—is very marked, as the borers are profoundly modified in various ways. Many borers, in consequence of their peculiar mode of life, have long, often flattened, bodies, are eyeless, and have lost their limbs, in part or wholly, through disuse, while their jaws, by which they eat their way through the wood, are enlarged and otherwise adapted for their lignivorous habits. The manifold adaptations of the larvæ of beetles, as seen in thousands of species, afford admirable examples, in the opinion of Lamarckians, of the effects upon a plastic organism of strains, stresses, and of use and disuse, in the production of the form of the body. It may be said in general that as soon as land plants, more or less tree-like in habit, however low or primitive in character, appeared (such as the tree-like club-mosses and allied flowerless forms of the Devonian and Carboniferous periods), a new world hitherto unoccupied was opened up to insect life, of which the insects speedily took advantage.

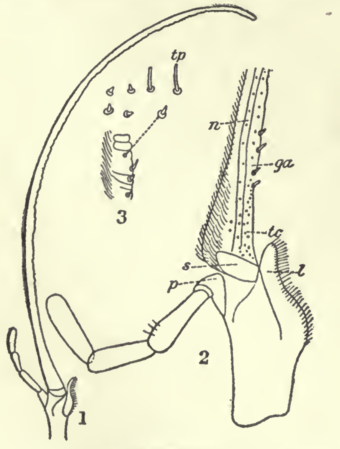
The earliest insects, as cockroaches, locusts, and the like, fed on dead leaves or herbaceous plants; others were aquatic and carnivorous. But as soon as plants became tree-like and grew in vast forests, new habitats were opened up, of which the insects immediately took advantage. It will thus be seen that the intimate relation between plants and insects must have taken place very early in geological history.

EFFECTS OF FLOWERS IN MODIFYING INSECTS. Coming now to consider the mutual relations and dependence of insects and flowers, we will first take up the subject of the adaptation of insects to feeding on the pollen or nectar of flowers. A few insects, some beetles and certain caterpillars, may devour the petals of flowers; but the chief attraction lies in the pollen or the nectar, and as the result we shall see that insects visiting flowers for the purpose of feeding upon their floral products are remarkably modified for this purpose. Hermann Müller has shown the way in which insects are fitted to obtain their floral diet, how many characters of flowers and of their visitors "have been developed in reciprocal adaptation, and which can therefore only be understood when considered together."

The insects which feed on pollen or nectar, and thus fertilize flowers, are certain bugs, beetles, flies, most moths and butterflies, wasps, and bees. It should be noticed that none of the primitive, generalized, or net-veined insects are included among these floral visitors. They contented themselves, as they do now, with the rank growth of herbaceous plants.

The true bugs (order Hemiptera) have the mouth-parts formed into a long beak adapted for piercing the flesh of animals or the leaves or stems of plants. But some of them (Anthocoris, etc.) are fitted by their small size to creep into and suck honey from many different flowers. Minute insects of another group (Thysanoptera) are constantly found in flowers of all sorts, where they feed both on pollen and honey. Müller says they seize a single pollen-grain in their jaws and convey it to the mouth: they obtain honey by applying the mandibles and maxillæ together so as to form a short, conical sucking apparatus. Their jaws and accessory jaws (maxillæ) are long and narrow, tapering to a sharp point, and here again we have long, slender, beak-like mouth-parts adapted for probing flowers.

The modifications of the maxillæ (jaws) of certain flower-visiting insects, adapting them in some cases for playing the part of butterflies and bees, are remarkable. Leaf-feeding beetles, such as chafers and chrysomelids, do much harm by devouring petals or entire flowers, but there is no resulting modification. "A review," says Müller, "of the mode of life of insects which visit flowers, and of the families to which they belong, shows continuous gradations from those which never visit flowers to those which seek them as a secondary matter, and finally to those which entirely depend upon them." In the great group of longicorn beetles (Cerambycidæ), in which the head is generally short, the jaws are directed downward, so they can use them in biting the bark of trees in order to oviposit in it. There is a group (Lepturidæ) which frequents flowers. These have the head lengthened out in front, a neck-like constriction behind the eyes, and consequently the power to direct the mouth forward while the prothorax is elongated and narrowed in front; besides this, the lobes of each maxilla are furnished with a brush of hairs. All these departures from the normal type and customary habits are the result of a process of adaptation to a floral diet. Müller attributes this to natural selection, but one will readily perceive that this view is not practical nor adequate. There may be another point of view. As this type of beetles multiplied and ordinary food became scarce, competition set in, necessities of existence drove the insects to the unusual diet of pollen and honey, and probably the body became modified as the result of constant effort in straining after the nectar at the bottom of flowers, and the creature became long-necked, long-headed, and its tongue-like maxilla especially adapted for brushing off and collecting grains of pollen. The case reminds one of the probable series of causes which led to the formation of the long neck and slender head and tongue of the giraffe.



MAXILLA OF NEMOGNATHA.

1. Maxilla (entire), showing the prolonged galea. 2. Enlarged view of basal part of maxilla, to show the taste-papillæ (*tp*), and cups (*tc*) on the galea (*ga*): *n*, nerve—a ganglionated nerve supplies each taste-papilla or cup; *l*, lacinia: *p*, palpifer; *s*, subgalea. 3. Part of end of galea, more enlarged to show the imperfect segments and the taste-organs. (*Henslow.*)

Other beetles gather pollen, and their mouth-appendages are adapted in accordance with this habit, while among certain families (e.g. Mordellidæ, Œdemeridæ) all the species in a perfect state depend entirely on a floral diet. The most remarkable of all beetles adapted for sucking honey is the flower-visiting Nemognatha (which means 'thread-like jaws'), in which the galea of each maxilla is of enormous length, so that the two together form a rude sucking-tube, roughly comparable with the tongue of the butterflies. It is believed to be very sensitive, as it contains many taste-cups. Here we see carried out almost to excess the idea of a tongue adapted for probing deep corollas. It is a case of convergence, where the action of similar efforts and mechanical strains have gradually resulted in structures of the same form in insects belonging to entirely different orders.

Flies. The majority of the flies (Diptera) resort to flowers for the little food they require in the imago state. And here the mouth-parts are very different in structure from those of biting insects, the long proboscis being a modification of a portion of the labium, representing the tongue or 'lingua' of other insects. The beautiful yellow, wasp-like drone-flies (Syrphidæ), so abundant about flowers and so important as fertilizers, depend mainly or exclusively on a floral diet; and here, as Müller states, "are found the most perfect adaptations to a diet alternately of pollen and honey." The complicated proboscis ends in two broad flaps. These flaps are "admirably adapted for seizing the pollen, for grinding it down, and for passing it backward, the apposed surfaces of the two flaps being closely set with parallel ridges of chitin, by which the pollen-grains are easily held fast and shoved into the entrance of the groove. Diptera, like the house and allied flies (Muscidæ, also the Stratiomyidæ), visit flowers to obtain both pollen and honey. These flaps are wanting in other flies, as the mosquito, and in the Bombyliidæ, which have enormously long tongues, as well as in other families (Empidæ and Conopidæ), and these flies visit flowers, probing them for the honey alone. Now, in these flies the head itself is not especially modified, but in Rhingia the head is developed into a long snout, the tongue being longer than the whole body. This fly (one of the Syrphidæ) is remarkably intelligent, probing the deeply hidden nectary of the iris and many other flowers. The species of Empis carry their long, thin, straight proboscis directed downward; hence they chiefly resort to erect flowers, into which they can plunge their proboscis vertically. In all these flies there is great variation in the shape and degree of specialization of the mouth-parts, these being in intimate relation with the habits of these highly specialized insects.

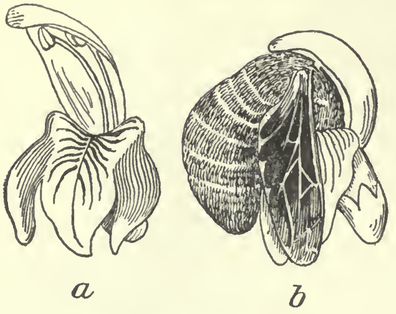
Hymenoptera. Still better adapted than the flies are the wasps, and especially the bees, which rely almost exclusively on a floral diet, and are most important as fertilizers of flowers. In bees (q.v.) the mouth-parts are wonderfully adapted for probing flowers, the maxilla being specialized in a variety of ways, while with its stout mandibles the bumblebee can cut a hole through the corolla of Salvia or Wistaria, without taking the trouble, as the honey-bee does, to seek out the nectary. Besides the mouth-parts, the hairy legs, especially those of the hinder pair, are so modified as to form pollen-baskets (corbicula), in which the pollen is heaped, or the bristly hairs on the under side of the hind body of the leaf-cutter bee are adapted for this purpose, while the hairs on most bees are 'spinulose,' or stiffly feathered, for the purpose of carrying the pollen-dust—all of which means of obtaining and carrying pollen are of direct importance in the fertilization of flowers. All these highly complex structures have evidently been brought about in response to the complicated series of muscular efforts and physical strains resulting from the attendance of these insects upon flowers.

The perfection of adaptation is attained in the moths and butterflies. These creatures and birds are clearly the most highly and wonderfully specialized of all animals. The butterfly is a most delicate and elaborate living flying machine, and all its characteristic structures have been drawn out in response to its mode of life, and of all the organs, its spiral tongue is the most marvelous in mechanism and adaptation. That the tongue (maxillæ) has been evolved in response to the visits to flowers with a deep corolla is, among other facts, suggested by that of its entire absence in many silkworm-moths. These sluggish, short-lived insects do not take liquid food, consequently by disuse the tongue is either in part or in certain forms entirely atrophied. The steps in development and specialization of the tongue of Lepidoptera, which is adapted for probing either flat or long and tubular corollas, may easily be traced. The end of the tongue is sometimes highly specialized. "Peculiar stiff, sharp-pointed appendages at the end of the laminæ enable them also to tear open delicate succulent tissues, and make use of the sap in flowers which secrete no honey." In response also to severe impacts and strains, the tip of the tongue of certain moths (Ophideres) are so spiny that they can pierce the skin of plums, peaches, and even oranges. In length, the tongue may vary from a minute pointed rudiment scarcely a millimeter in length to that of the hawkmoths, which may be 80 millimeters long, while in a Madagascar sphinx the tongue is 9¼ inches in length, and as there are said to be orchids with flowers as deep as this, there is evidently a relation of cause and effect between the phenomena.

ORIGIN OF FLORAL STRUCTURES THROUGH INSECT AGENCY. Having seen that insects have been highly modified in various ways by the use and disuse of organs, while seeking pollen and nectar, we may now inquire into the result of such visits or stimuli upon the flowers themselves. Many facts and ingenious suggestions have been made by Henslow in his *Origin of Floral Structures*. His conclusion is that a flower with a conspicuous corolla or perianth has originated from "a leaf-bud of which some of the members have already differentiated into carpellary, others into staminal organs, the outer appendages being simply bracts, like, we will say, those surrounding the stamens or ovule of the yew." Insects probably visited the primitive flowers for pollen, but also pierced the juicy tissues for moistening the honey. Gradually the nectar was evolved, and after a time the earliest-formed flowers having attracted insects to come to them regularly, a numerous series of differentiations would result. The corolla, in all probability, would be the first to issue out of the tracts. Other changes would follow by degrees and in different combinations. From regular, irregular flowers like those of the pea would arise. But all such changes "would be due to the responsive action of the protoplasm, in consequence of the irritations set up by the weights, pressures, thrusts, tensions, etc., of the insect visitors. Thus, then, do I believe that the whole floral world has arisen."

Irregular flowers, as that of the pea, have been made such by the visits of the bees and other external influences. When a flower is situated laterally and projects horizontally, or nearly so, an insect is compelled to alight upon it on one side only, when approaching it directly from the front. It then throws all its weight upon the organs on the lower or anterior side of the flower, as is the case with the keel-petals of papilionaceous flowers, with the lips of labiates, etc.; or else its weight is sustained by the stamens or style, or by both together, as in Epilobium angustifolium, Circæa, Veronica, larkspur, and monkshood; and whenever the stamens are declinate, as in horse-chestnut, Dictamnus, Echium, Amaryllis, etc. Henslow assumes that the primary cause of irregularity must come from without, from an insect —i.e. from the mechanical influence of its weight and pressures. "To this external irritation the protoplasm of the cells responds, and gives rise to tissues which are thrown out to withstand the strains due to the extraneous pressures of the insect, and so the flower prepares itself to maintain an equilibrium under the tensions imposed upon it, and irregularities are the result." Such modifications occur in the bilobed calyxes of furze and Salvia, with many forms of lips, and in enlarged anterior petals or in dependent stamens, as those of aconite and Epilobium. The lip of Lamium consists of one much enlarged petal, which forms an excellent landing-place for a bee to rest upon, while the two lateral petals, not being required, are atrophied to mere points. In like manner, the two posterior petals are enlarged to form the hood, presumably due to the backward thrust of the insect's head." In the irregular flowers of the foxglove and the Gloxinia, as well as Petunia to a slight extent, and in the regular campanulate flowers, the tube of the gamopetalous corolla "has enlarged so as to permit the ingress of an insect which partly or entirely crawls into it; then it is this tubular part which, more especially having to bear the strain upon it, bulges outward or becomes more or less inflated in form, while the lip or anterior petal, not having to bear the entire burden, is not particularly enlarged, if it be at all." Henslow states that if no more than the head of an insect enter the flower, "then the corolla shapes itself to fit it"; thus the snowberry, Scrophularia, and Epipactis only admit the heads of wasps, which are the regular visitors of these flowers. How the deep tubular corolla of the evening primrose or the honeysuckle has been brought about is explained by the fact that butterflies, in probing their depths while on the wing, irritate the tube only, "which thus elongates and contracts, resulting in little or no irregularity in the flowers." Also flowers like the narcissus and evening primrose prevent the ingress of short-tongued insects. The origin of irregular flowers is illustrated by Davernoia adhatodoides, whose curiously shaped lip affords an excellent landing-place for a big bumblebee; "moreover, the two walls slope off, and are gripped by the legs of the bee, so that it evidently can secure an excellent purchase, and thus rifle the flower of its treasure at its ease."

The immediate cause of the shape of the wing-petals of many papilionaceous flowers is attributed to the "weight of the insect in front, the local irritations behind, due to the thrust of the insect's head in probing for nectar, coupled with the absence of all strains upon the sides." Good examples of the occurrence of great thickening of the tissue just where the strain will be most felt are to be seen in the slipper-shaped flowers Cypripedium, Calceolaria, etc.

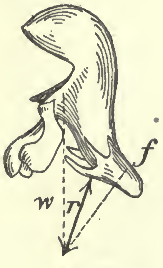


DAVERNOIA ADHATODOIDES.

a, The flower, an example of an irregular corolla adapted to the needs of its insect visitors; *b*, appearance when entered by a bee. "The weight of the bee must be very great, and the curious shape of the lip with its lateral ridges is evidently not only an excellent landing-place, but is so constructed as to bear that weight. Moreover, the two walls slope off and are gripped by the legs of the bee so that it evidently can secure an excellent purchase, and can thus rifle the flower of its treasure at once." (*Henslow.*)

If the reader will turn to the article Kinotogenesis, he will see how exactly parallel are the cases cited with those mentioned for plants by Henslow. In part he says: "In alluding to the above instances of levers and mechanical powers in plants, one mentally recalls how abundant they are in the distribution of the bones and muscles in vertebrates. I cannot help thinking, therefore, that the old view was fundamentally correct; that such have been gradually brought into existence by the efforts to meet the strain put upon them. If this be true, then one and the same law has prevailed in the evolution of organs in both the animal and vegetable kingdoms."

The accompanying figure explains how the forms of the calyx and corolla are adjusted to bear the weight of the insect. The bee, he says, alights on the lip and then partly crawls into the expanded mouth of the corolla, so that its weight now lies in the direction of *w*. The fulcrum will be at *f*, and the resultant of these is in the opposite direction to *r*. This is where the strain will be felt; "so that it is just at this point where the backward curvature takes place which gives strength to the corolla-tube. This latter is greatly supported by the tube of the calyx, which, as stated, has a curiously thickened cylinder within the mesophyl."



LAMIUM.

A flower of *Lamium album*, showing distribution of forces under insect visitation: *w*, direction of pressure from the insect's weight; *f*, fulcrum; *r*, resultant, opposite to the direction of *r*.

Other structures, as projecting hairs, are so situated as to form obstructions to the entry of small insects which would be unable to pollinate the flower. In the gentian there are tooth-like processes at the entrance of the corolla; in the Indian pipe and a Daphne a large circular stigma nearly blocks up the tube. Insects have been repeatedly observed to lick the various parts of flowers, and thus maintain an intermittent irritation and consequent formation of hairs and other products. Müller has often watched a fly (*Rhingia rostrata*) licking the staminal hairs of a Verbascum, and in many cases the hairs on the filaments offer a foothold to the insects while visiting the flowers, as in the mullein; such hairs, Henslow claims, "being the actual result of the insects clutching the filaments or rubbing them with their claws."

The chief attraction of flowers to insects is of course their honey-glands or nectaries, and these are thought by Henslow to have originated from the visits of insects which, at first attracted to the juicy tissues of flowers, "by perpetually withdrawing fluids have thereby kept up a flow of the secretion which has become hereditary, while the irritated spot has developed into a glandular secreting organ." These spots occur at different places in different flowers, "wherever the prevailing insect found it convenient to search." On the other hand, nectaries disappear, when the whole flower degenerates and becomes regularly self-fertilizing or else anemophilous, so that insects do not visit them. Henslow even suggests that the insectivorous pitchers of Nepenthes may have been due to the external irritation caused by insects, for Sir J. D. Hooker had already shown that they originate from water-glands. The continuous flow of nectar has its analogy in the daily regular, though intermittent, mechanical irritation, and its inherited effects, which keep up the secretion of milk in the goat and cow. Ants play their part in bringing about changes in what are called, for this reason, 'ant plants.' The hypertrophied stipules or thorns of Acacia, and the stems of Myrmecodium, as shown by Beccari, are due to the irritation set up by these insects, which bring about a hypertrophy of the cellular tissue. A small swelling appears on the tigellum of Myrmecodium, serving the purpose of a reservoir of water, which only grows larger through the agency of ants. Henslow also attributes the large honey-pits at the base of the leafstalks on Acacia sphærocephala, as well as the terminal 'fruit bodies' occurring on the tips of the leaflets, to the same cause—viz. the mechanical irritation of the ants.

Colors. The colors of flowers are primarily due to nutrition. The parti-colored spots and streaks leading down into the bottoms of flowers, called 'guides' and 'pathfinders,' invariably lead to the nectaries, and these effects seem directly due to the visits of insects. "The guides," says Henslow, "like obstructing tangles of hair and nectaries, are always exactly where the irritation would be set up, and I take them to be one result of a more localized flow of nutriment to the positions in question. Instead, therefore, of a flower having first painted a petal with a golden streak to invite the insect, and to show it the right way of entering, the first insect visitors themselves induced the flower to do it, and so benefited all future comers." The facts and theories suggested by the colors of flowers are further borne out by the geological history of fossil flowering plants and of those orders of insects containing flower-visiting forms. In the Paleozoic age there were, so far as yet known, no flowers, nor any moths, flies, ants, or bees. The first flowering plant, the screw-pine, appeared in the Permian, but its flowers were greenish and inconspicuous. Early in the Mesozoic age more modern plants appeared, and by this time the most primitive beetles, moths, and hymenopterans probably arose, although the traces discovered are very scanty. But at the opening of the Upper Cretaceous vast forests of deciduous trees clothed the uplands, while in the jungles, in the plains, and in the openings of the forests true flowers abounded, since fossil composite blossoms, like the sunflower, occur in the Upper Cretaceous clays of New Jersey. Now, the remains of moths, butterflies, many flies, ants, and bees abound in the Middle Tertiary, and undoubtedly their forerunners existed in the Cretaceous, so that we are justified in assuming that flowers and the insects which visit them were nearly simultaneously brought into existence, and from all that has been said it is a reasonable theory to advance that the forms of flower-visiting insects were the result of the presence of flowers, and that flowers have been modified from small greenish forms of inflorescence into the beautiful creations which now deck the fields and adorn our gardens.

Bibliography. Darwin, *Forms of Flowers* (London, 1877); Kerner, *Flowers and Their Unbidden Guests* (London, 1878); H. Müller, *The Fertilization of Flowers*, translation by Thompson (London, 1883); Henslow, *The Origin of Floral Structures, Through Insect and Other Agencies* (2d ed., New York, 1893); Coulter, *Plant Relations* (New York, 1899).

FLOWERY KINGDOM, The. A name for China.

FLOW STRUCTURE. See Igneous Rocks.

FLOX ÆʹRIS (Lat., flower of copper, from *phlox*, Gk. φλόξ, flame, flower, from φλέγειν, *phlegein*, to blaze, and *æs*, copper). A term applied by the older writers on chemistry to the finely divided powder obtained by pouring water on the surface of freshly melted copper, and consisting of the red (cuprous) oxide of copper.

FLOYD, John Buchanan (1807-63). An American politician and Confederate leader, born at Blacksburg, Va. He graduated at the College of South Carolina in 1826, studied law, and practiced his profession at Helena, Ark., from 1836 to 1839, when he returned to his native State and continued his practice in Washington County. In 1847-49 he served in the Virginia State Legislature, and in 1850 was chosen Governor of the State, in which capacity he advocated the laying of a tax on the products of States which would not deliver up fugitive slaves owned in Virginia. President Buchanan appointed him Secretary of War in 1857. Here his extraordinary incapacity for an executive office was lost sight of in the more serious grievances arising out of his relations with the leaders of the secession movement. Early in 1858 he began a rather questionable practice of accepting drafts from a firm of Government contractors in anticipation of their earnings. In December, 1860, Floyd, whose resignation had been requested by the President, retired from the Cabinet. After the war began he was commissioned a brigadier-general in the Confederate service, commanded in some unsuccessful operations in western Virginia, and was senior commanding officer at Fort Donelson. When it was clear that capitulation was inevitable, Floyd fled in the night, together with Pillow, his second in command, and part of their troops, and left General Buckner to surrender to General Grant. (See Fort Henry and Fort Donelson.) Two weeks later Floyd was relieved of his command. Consult: Rhodes, *History of the United States*, vol. iii. (New York, 1895); Crawford, *Genesis of the Civil War* (New York, 1887); Davis, *Rise and Fall of the Confederate Government* (New York, 1881); Nicolay and Hay, *Life of Lincoln* (New York, 1890).

FLOYD, William (1734-1821). An American patriot, one of the signers of the Declaration of Independence, born in Suffolk County, N. Y. On the approach of the Revolutionary War he identified himself with the Patriot party, and in September, 1774, was sent as a delegate to the first Continental Congress. He was subsequently a member of the Continental Congress from 1775 to 1777, and again from 1778 to 1783; was a State Senator from 1777 to 1788, and from 1789 to 1791 was a member of the first Congress under the Federal Constitution. In 1794 he removed to Oneida County, then on the frontier; in 1801 was a member of the State Constitutional Convention; and in 1808 was again elected to the State Senate. Consult: Sketches in Dwight, *Signers of the Declaration of Independence* (last ed., New York, 1895); Sanderson, *Biography of the Signers to the Declaration of Independence* (Philadelphia, 1828); and an article in the *Magazine of American History*, vol. i. (New York, 1877).

FLOYʹER, Sir John (1649-1734). An English physician and scholar, born at Lichfield. He got his education at Queen's College, Oxford, and was knighted about 1686. He invented the pulse-watch, and his work on asthma was important, as it gives the first description of emphysema of the lungs. His works on other subjects than those mentioned include: *The Touchstone of Medicines* (1687-90); *Preternatural State of the Animal Humors* (1696); *The Sibylline Oracles* (1713); *A Vindication of the Sibylline Oracles* (1715); *Essays on the Creation and on the Mosaic System* (1717); *Medicina Geronomica* (1724); and *A Comment on Forty-two Histories Described by Hippocrates in his 'Epidemics'* (1726).

FLÜCKIGER, flụkʹê-gẽr, Friedrich August (1828-94). A German pharmacognosist. He was born at Langenthal, Switzerland, and was educated at Berlin, Bern, Geneva, and Heidelberg. He was president of the Swiss Association of Apothecaries from 1857 to 1866, and professor of pharmacognosy at Bern (1870-73) and Strassburg (1873-92). He was also a member of the commission appointed to revise the pharmacopœia of the German Empire (1881-88). As a writer also he exerted a far-reaching influence upon the development of the science with which he was so long prominently identified. Among his chief publications may be mentioned: *Pharmakognosie des Pflanzenreichs* (3d ed. 1891); *Grundlagen der Pharmakognosie* (2d ed. 1885); *Pharmacographia: A History of the Principal Drugs of Vegetable Origin Met with in Great Britain and British India*, with Hanbury (2d ed. 1879);

Pharmaceutische Chemie (2d ed. 1888); *Grundriss der Pharmakognosie* (2d ed. 1894).

FLUDD, Robert (1574-1637). An English physician and mystic philosopher. He was born at Bearstead, Kent, England, was educated at Oxford, where he took the master's degree in 1598, and spent six years in study and travel on the Continent. Having returned to England, he studied medicine, was admitted to practice in 1606, and was elected a fellow of the College of Physicians in 1609. While on the Continent he had become interested in scientific experiments and natural philosophy, and maintained a laboratory where he constructed various sorts of odd mechanisms, such as an automatic dragon and a self-playing lyre. Some of his inventions were more useful, and some writers contend that he was the original inventor of the barometer. In 1615 he became interested in the doctrines of the mysterious fraternity of the Rosicrucians, and wrote in Latin several elaborate vindications and expositions of it. He also became a follower of Paracelsus, and attempted to formulate a system of philosophy based on his teachings, and setting forth the identity of physical and spiritual truth. His writings attracted the attention of Kepler, Gassendi, and Mersenne, all of whom considered them of enough importance to demand refutation. Among his published works were: *Apologia Compendiaria, Fraternitatem de Rosea Cruce Abluens* (1616); *Tractatus Apologeticus Integritatem Societatis de Rosea Cruce defendens* (1617); *Tractatus Theologophilosophicus*, etc. (1617), a treatise in three parts, dedicated to the Rosicrucian Fraternity; *Veritatis Proscenium* (1621), a reply to Kepler; *Philosophia Sacra et Vere Christiana* (1629); *Sophiæ cum Moria Certamen*, etc. (1629), and *Summum Bonorum* (1629), both replies to Mersenne; *Doctor Fludd's Answer unto M. Foster, or the Squesing of Parson Foster's Sponge* (1631); and *Philosophia Mosaica* (1638; English edition *Mosaicall Philosophy*, 1658). Consult Waite, *The Real History of the Rosicrucians* (London, 1887).

FLÜE, flụ′e, Nikolaus von der (1417-87). A Swiss hermit, whose real name was Löwenbrugger, born in the Canton of Unterwalden ob dem Wald. In 1467 he abandoned his family and became a hermit in the Alps. He had great influence among the people, and in 1481, at the Diet of Stans, saved the Confederation by his plea for union. He was beatified by Clement IX. in 1669, and is the patron of the original Swiss cantons. Consult: Ming, *Der selige Eremit Nikolaus von Flüe* (Lucerne, 1861-71); Herzog, *Bruder Klaus* (Bern, 1887); and Rochholz, on the legends connected with his name, *Die Schweizerlegende vom Bruder Klaus von Flüe* (Aarau, 1874).

FLÜELEN, flụ′el-ĕn (It. *Fiora*). A village of Switzerland in the Canton of Uri, near the southern end of Lake Lucerne (Map: Switzerland, C 2). Population, in 1900, 969. It is an important military station of the Swiss Republic, and is situated at the junction of the Axen and Saint Gotthard roads. It is also connected with the more important Swiss cities by rail.

FLUELLEN, flo͞o-ĕl′ĕn. A disputatious and voluble but pugnacious little officer in Shakespeare's *Henry V.* His strong Welsh accent is one of the humorous elements of the piece.

FLÜGEL, flụ′gel, Gustav Lebrecht (1802-70). A German Orientalist. He was born at Bautzen, Saxony, was educated in theology and philology at Leipzig, and studied Oriental languages at Vienna, and in Paris under De Sacy. From 1832 to 1850 he was a professor in an academy at Meissen. He published the text of the *Koran* which is in most general use in the West (1833). Among his other works are an edition of the dictionary of Hadschi-Chalfa, with a Latin translation (1835-58; published at the expense of the London Oriental Society); *Concordantiæ Corani Arabicæ* (1842); *Mani, seine Lehren und seine Schriften* (1862); the catalogue of the Oriental manuscripts at Vienna (1865-67); and a *Geschichte der Araber* (1840).

FLÜGEL, Johann Gottfried (1788-1855). A German lexicographer, born at Barby, Saxony. He was for a time a merchant, and in 1810 emigrated to America, where he made a special study of the English language. Returning to Germany in 1819, he was in 1824 appointed professor of English in the University of Leipzig. In 1838 he became American consul at Leipzig, and in later years was German representative and correspondent of many literary and scientific institutions of the United States. His reputation rests chiefly on his *Vollständiges englisch-deutsches und deutsch-englisches Wörterbuch* (1830). *Triglotte, oder kaufmännisches Wörterbuch in drei Sprachen: deutsch, englisch und französisch* (1836-40) enjoyed a lesser reputation.

FLÜGEL, Otto (1842—). A German philosopher, born at Lützen. He studied at Schulpforta and Halle, and became pastor of the Evangelical Church at Wansleben, near Halle. He took Ziller's place as editor, with Allihn, of the *Zeitschrift für exacte Philosophie im Sinne des neueren philosophischen Realismus*, and in 1894 founded, with Rein, the *Zeitschrift für Philosophie und Pädagogik.* His philosophic position supports Herbartian realism, as opposed to Neo-Kantian tenets; but in theology he holds that revelation is necessary to give certitude to the mere probabilities about a first cause, to which philosophy leads. His writings, outside of contributions to the periodicals mentioned, are: *Der Materialismus vom Standpunkte der atomistisch-mechanischen Naturforschung* (1865); *Das Wunder und die Erkennbarkeit Gottes* (1869); *Die Probleme der Philosophie und ihre Lösungen, historisch-kritisch dargestellt* (3d ed. 1892); *Die Seelenfrage* (2d ed. 1888); *Die speculative Theologie der Gegenwart* (2d ed. 1888); *Ueber das Seelenleben der Thiere* (2d ed. 1886); *Das Ich und die sittliche Idee im Leben der Völker* (2d ed. 1888); *Ritschls philosophische Ansichten* (2d ed. 1892); *Die Sittenlehre Jesu* (3d ed. 1892); and *Ueber die persönliche Unsterblichkeit* (2d ed. 1892).

FLÜGELHORN, flụ′gel-hôrn (Ger., winghorn). The German name for instruments of the bugle family. The flügelhorn formerly used in the German Army was built in the keys of E♭, D, C, B♭, and A. It is now entirely replaced by the cornet. Meyerbeer employs the flügelhorn in his *Robert le Diable.* See Bugle.

FLÜGGE, flụ′ge, Karl (1847—). A German hygienist. He was born at Hanover, and studied medicine at Göttingen, Bonn, Leipzig, and Munich. He was a lecturer at Berlin from

1878 until 1883, when he was called to the chair of hygiene at the Hygienic Institute in Göttingen. In 1887 he was called to a similar position at Breslau. His original researches in the departments of experimental hygiene and bacteriology have found wide recognition. In the well-known work entitled *Beiträge zur Hygiene* (1872), he discusses house sanitation, porosity, and defilement of the soil, and the food distributed in charitable institutions and hospitals. His other works include *Die Mikroorganismen* (3d ed. 1896), and *Grundriss der Hygiene* (4th ed. 1894). In collaboration with Koch, the celebrated bacteriologist, he became an editor of the *Zeitschrift für Hygiene* in 1886.

FLÜGGEN, flų'gen, Gisbert (1811-59). A German genre painter, born at Cologne. He studied at the Academy of Düsseldorf, and then settled in Munich in 1835. He painted in the manner of Wilkie, and is often called 'the German Wilkie.' His work abounds in eighteenth-century sentimentalities. His best pictures are: "Servants Surprised" (1839); "The Chess Players;" "The Interrupted Marriage Contract;" and an historical painting, "The Last Minutes of the King Frederick Augustus II. of Saxony." His son, Joseph (1842—), genre and historical painter, was born in Munich, and studied at the academy there. His works include "The Flight of the Landgravine Elizabeth" (1867), and "The Daughter of the Hostess" (1869).

FLUID (Lat. *fluidus*, flowing, from *fluere*, to flow, Gk. *φλύειν*, *phlyein*, to overflow). A general name applied to liquids and gases. Fluids readily assume the form of the vessel in which they are contained, an exceedingly small force being sufficient to change the relative position of their molecules. Gases are compressible or elastic fluids, their volume depending on the pressure exerted upon them. Liquids are relatively incompressible. The term fluids has also been applied to hypothetical substances which were supposed to cause the phenomena of heat, magnetism, and electricity. The luminiferous ether, in which, according to modern science, the waves of light, electricity, and radiant heat are propagated, is also sometimes referred to as a fluid. See Elasticity; Hydrostatics; Matter, Properties of; Critical Point; etc.

FLUKE (AS. *flōc*, flat fish, Icel. *flōki*, kind of halibut). In ichthyology, a name applied, more commonly in Great Britain than in the United States, to various species of flounders (q.v.). A familiar example is the Scotch bonnet-fluke or brill (*Rhombus lævis*).

FLUKE, or Fluke-Worm. The popular name of various trematode worms, especially those which live endoparasitically. The name liver-fluke is especially applied to *Distomum hepaticum*, which is common in the liver and biliary ducts of ruminants, particularly of sheep, in which it produces the disease called *rot*, often causing great mortality in flocks during wet seasons and on ill-drained lands. It is generally less than an inch in length, of an oval form, its breadth about half its length; flat, in color like the liver in which it exists; it has no eyes nor other known organs of special sense; it is hermaphrodite, and the organs of reproduction occupy a great part of its body; its anterior extremity is furnished with a sucker, and another is situated at a short distance back on the ventral surface, but the terminal sucker alone is perforated, and serves as a mouth, by which bile, the food of the creature, is imbibed; the tube which proceeds from it does not, however, become a proper intestinal canal, but soon divides into two large branches, and ends in minute ramifications in all parts of the body. Large numbers of flukes are sometimes found in the liver of a single sheep, and of very different sizes, but they are now believed not to multiply there as was formerly supposed. Their eggs, indeed, are produced there in great quantity, but find their way into the outer world to begin a series of transformations which are among the most extraordinary in the whole animal kingdom. The genus contains a great number of species, infesting, in their mature state, different kinds of animals, and finding their appropriate place in very different parts of the animal frame.

Instances have occurred of the presence of *Distomum hepaticum* and two other species in the human liver and vena portæ; but their influence on the system is unknown; a species of much elongated form (*Gynæcophorus hæmatobium*) is very common in Egypt, infesting the vena portæ of man, and the walls of the urinary bladder, and producing local, and afterwards general disease; a small species (*Distomum ophthalmobium*) has been found in the human eye, but probably through some such accident as in another case has led to the occurrence of the common fluke under the skin of the foot, where it caused a sore. Of all the known species, the Egyptian (*Gynæcophorus hæmatobium*) is by far the most hurtful, as infesting the human body. This species is also remarkably different from the others, in not being hermaphrodite, and in the extreme dissimilarity of the male and female; the female being a thread-like worm, for which a lodgment is provided in a furrow on the ventral surface of the male. See Trematoda.

FLUME (from OF. *flum*, river, from Lat. *flumen*, stream, from *fluere*, to flow). An artificial channel used to convey water for power development, hydraulic mining, and irrigation. It is most commonly of wood, but may be of steel. It is placed above ground; often on trestles or other elevated supports to keep it in a nearly level position. See Irrigation.

FLU'ORES'CENCE (cf. Fr. *fluorescence*, Sp., Port. *fluorescencia*, from Lat. *fluor*, flux, from *fluere*, to flow). When ether-waves are absorbed by a body which they have entered, their energy, as a rule, is distributed throughout the minute particles of the body, and some heat effect is produced, generally rise in temperature. As a result of this the body will now radiate more energy than before, and in so doing will give out waves in the ether which are called heat-waves, i.e. their wave-length is long. Thus, a piece of red glass absorbs certain ether-waves, among them all the visible ones except those which combine to produce the sensation red in the human eye. The temperature of the glass rises, and it emits ether-waves which are too long to affect the sense of sight. There are many bodies, however, in which the energy of the absorbed waves is not spent in producing rise in temperature, and the consequent emission of long heat-waves, but is spent in producing the emission of ether-waves which are short enough to affect the sense of sight. Thus if the extremely short ether-waves which do not affect our eyes, and which are called the ultra violet rays, or if the shorter visible rays, e.g. the violet and blue ones, are absorbed by the body, and if in return for the energy thus absorbed, longer visible rays, such as those in the green, yellow, or red, are emitted, the bodies are said to 'fluoresce,' and the entire phenomenon is called 'fluorescence.' This was first observed by Sir David Brewster for an alcoholic solution of chlorophyll. He found that when a beam of sunlight was passed through such a chlorophyll solution the path of the beam was marked by a brilliant red light, although the colors which were absorbed by the chlorophyll were the blue, yellow, and orange. It should be noted here that the fluorescent light, namely the red color, corresponds to a wave-length which is longer than that of the absorbed colors. This same phenomenon was observed by Herschel in the case of a dilute solution of sulphate of quinine. If a beam of sunlight falls upon this liquid the portions of the surface where the light is incident exhibit a bright blue color, which is confined to the surface layer.

Herschel also observed that if a beam of sunlight, after passing through a cell containing sulphate of quinine, is transmitted through a second cell of the same solution, there will be no fluorescence in the latter. This means that that constituent of sunlight which developed the blue fluorescent color in the first solution was entirely absorbed by it, and that therefore the transmitted light contained no waves which were able to excite fluorescence in the second cell. The whole explanation of the phenomena of fluorescence is due to Sir G. G. Stokes. He has shown that it is exhibited in a greater or less degree by a great many substances, including ivory, bone, some kinds of paper, etc. The fact that it is seen in many violet and green varieties of 'fluor-spar' suggested to Stokes the name 'fluorescence' itself. Fluorescence is shown most vividly by so-called canary glass, which is glass colored with oxide of uranium; in most kinds of paraffin oil, and by solutions made from the bark of the horse-chestnut tree. In all cases, however, the law announced by Stokes and called by his name, viz., the fluorescent light is of a longer wave-length than that of the absorbed waves which causes the fluorescence, is found to be true. Thus the waves absorbed by the quinine solution are in the ultra violet, as they are also in the case of the paraffin oils. Similarly, canary glass absorbs the violet and blue rays, and fluoresces with a greenish yellow color.

It is thus evident that fluorescence offers a method for the study of ultra-violet spectra, because if, for example, the solar spectrum be allowed to fall upon a screen which is moistened with some fluorescent substance, the positions of the 'Fraunhofer lines' will be conspicuous by the fact that there is no light emitted at those places, whereas other portions of the screen where light is being absorbed will fluoresce.

Almost all fluorescent bodies cease to emit light the instant the incident light is stopped; but others, notably the sulphides of barium, strontium, and calcium, continue to emit their fluorescent waves for some time after the incident light has been cut off. Such bodies are called 'phosphorescent,' and the phenomenon is called 'phosphorescence.' It should be carefully noted that this has nothing whatever to do with the ordinary luminosity of phosphorus itself, which is due to its slow oxidation. Consult Preston, *Theory of Light* (New York, 1895). See LIGHT.

FLUORIDES (from *fluor*). The salts of hydrofluoric acid. See FLUORINE.

FLUORINE (from *fluor*). A non-metallic chemical element, one of the so-called halogens. Its elementary nature was first recognized by Davy, although it was as yet unknown in the free state, and remained unknown until 1887, when Moissan succeeded in isolating it from potassium hydrogen fluoride, by a process of electrolysis. Fluorine is not found native, but occurs combined as fluorite, a calcium fluoride; as cryolite, an aluminum-sodium fluoride; and, in smaller quantities, in many other minerals, as apatite, fluocerite, topaz, wagnerite, wavellite, yttrocerite; also in sea-water, mineral springs, and rivers, as well as in the stems of grasses, and in bones and other animal substances.

Fluorine (symbol, F or Fl; atomic weight, 19.1) is a light, greenish-yellow gas of a penetrating and disagreeable odor that has an irritating effect on the eyes and on mucous membranes. It decomposes water, forming hydrofluoric acid with its hydrogen and setting free ozonized oxygen. Antimony, arsenic, boron, iodine, silicon, and sulphur are capable of burning in an atmosphere of fluorine, and many organic substances, such as alcohol, when brought in contact with it, take fire. Hydrogen combines with it, even in the dark, forming the well-known hydrofluoric acid.

Hydrofluoric acid is prepared by gently heating one part of pure fluorite with about twice its weight of sulphuric acid in a leaden retort, the anhydrous acid thus produced being condensed in a receiver surrounded by a freezing-mixture. It is a colorless, mobile liquid that boils at 19.4° C. (67° F.), and solidifies to a white crystalline transparent mass at −102.5° C. (−152.5° F.), and has a powerful corrosive action on organic tissues, producing severe burns on the skin. For commercial use, the acid is made by passing the anhydrous vapor directly into a leaden receiver containing water, and is then obtained in dilute form. Owing to its corrosive nature, it must be preserved in lead, gutta-percha, or ceresine bottles. The aqueous acid has the property of dissolving glass, and is therefore extensively used for etching on glass; e.g. in marking the divisions on a thermometer tube.

Other compounds of fluorine include *hydrofluosilicic acid*, whch is prepared by heating a mixture of sulphuric acid, fluorite, and silica (sand or powdered glass), and passing the gaseous silicon fluoride into water. It does not attack glass directly, but on heating it decomposes with formation of free hydrofluoric acid, and this attacks the silica of the glass; hence its application for etching. Hydrofluosilicic acid combines with bases to form salts called *fluosilicates* or *silicofluorides*, of which the most important are those of potassium and sodium. Certain compounds of fluorine have valuable antiseptic properties, and a solution containing 0.61 of ammonium fluosilicate has been used as a wash for wounds. Fluorine compounds may also be employed for preserving food without communicating any taste to it.

FLUORITE (from *fluor*), or FLUOR-SPAR. A calcium fluoride that crystallizes in the isometric system. It is found both massive and crystallized, and may be white, yellow, green, red, blue, or brown in color, sometimes showing a bluish fluorescence. Varieties of fluorite having different colors have been called *false amethyst, emerald, ruby, topaz,* etc. When heated, certain varieties become phosphorescent. Fluorite occurs in Cumberland and Derbyshire, England (where fine-colored specimens called *Derbyshire spar* are found), in Norway, Saxony, and Switzerland. In the United States crystallized varieties have been found in Saint Lawrence County, N. Y.; Hardin County, Ill.; near Saint Louis, Mo., Pike's Peak, Colo., and in the Lake Superior region. Fine transparent specimens have been carved into vases and other similar ornaments, and in such forms fluorite was highly prized by the ancients. Commercial fluorite is obtained in Caldwell, Crittenden, and Livingston counties, Ky.; from near Rosiclare, Ill.; and in Yuma County, Ariz. It is used as a source of hydrofluoric acid, which is employed for etching on glass, in the manufacture of opalescent glass, and as a flux in iron-smelting. In 1900 the production in the United States amounted to 13,450 short tons, having a total value at the mines of $94,500. A dark blue Bavarian variety of fluorite, called *antizonite,* gives off a strong odor that produces headache and vomiting, said to be due to the liberation of pure fluorine.

FLU'OROSCOPE (from Lat. *fluor,* flux + *σκοπεῖν, skopein,* to look). A screen, coated with some fluorescent material such as calcium tungstate or barium platino-cyanide placed at one end of an opaque box, into which the observer looks to see the shadows cast by the Roentgen rays.

FLUOR-SPAR. See FLUORITE.

FLÜRSCHEIM, flụr'shīm, MICHAEL (1844—). A German agitator of land-reform, born in Frankfort-on-the-Main. He lived in the United States from 1867 to 1872. Upon his return to Germany he founded the iron-works at Gaggenau, Baden, and in 1892 made his home at Castagnola, near Lugano, Switzerland. He aims to show that the revenues accruing to the individual owner from taxes and ground rent are the primary cause of the accumulation of vast fortunes by the few, and of the indigence and suffering of the masses; and that the control of land by the State would remove this evil and would at the same time counteract the evils of socialism. The following maintain the advantages of individualism and are a few of his principal works: *Auf friedlichem Wege* (1884; frequently reprinted); *Deutschland in hundert Jahren* (2d ed. 1890); *Der einzige Rettungsweg* (rev. ed. 1890); and *Rent, Interest, and Wages* (1891). In the last-mentioned work the author acknowledges his great indebtedness to Henry George, whose ideas, however, he subjects to some modification.

FLUSH'ING (Dutch *Vlissingen*). A seaport of the Netherlands, situated on the south coast of the island of Walcheren, at the mouth of the Western Scheldt (Map: Netherlands, B 3). It was formerly an important fortress and naval station of the Netherlands, but since 1873 has been transformed into a trading centre. The harbor admits large sea-going vessels, a considerable foreign trade passing through the port, principally with England and India. The chief industries are ship-building and the manufacture of machinery and tobacco. The town exports agricultural products; the principal articles imported are petroleum, lumber, coal, and iron. Flushing is the seat of a United States consular agent. A railway constructed through Zealand to join the main Continental lines has its terminal station close to the harbor, and a daily service by steamers is carried on between Flushing and Queenborough, England. Flushing is strongly fortified and commands the entrance of the Scheldt. Population, in 1889, 13,165; in 1900, 18,893. Flushing is the birthplace of Admiral de Ruyter. It was stormed and taken by the English in the Walcheren expedition under Lord Chatham in 1809.

FLUSHING. Formerly a village, now included in the Borough of Queens, New York City (Map: Greater New York, H 5). The township was settled in 1643 and the village about two years later, both being called at first Vlissingen, of which the present name is a corruption. About 1660 the population became predominantly Quakers.

FLUTE (OF. *fleüte, flaüte,* It. *flauto,* from OF. *flaüter,* to play the flute, from Lat. *flatus,* blast, from *flare,* to blow; connected with OHG. *blājan,* Ger. *blähen,* AS. *blāwan,* Eng. *blow*). One of the oldest wind instruments, well known to the ancient Greeks and Hebrews. It has a soft and pleasant quality of tone, is an important instrument in orchestral music, and, in consequence of its easy treatment, is much in favor with amateurs. The flute is commonly made of boxwood or ebony, but sometimes of ivory or silver. Its form is that of a taper tube, made in four pieces, with six holes for the fingers, and with from 1 to 14 keys, which cover or open other holes. The sound is produced by blowing into the embouchure, an oval kind of hole at one side of the thick end, so that the air in its passage from the mouth is broken against the opposite edge of the hole, which causes the column of air inside the tube to vibrate. The notes of the gamut are produced by the opening or shutting of the holes by the fingers of both hands. The compass of the flute is from b to c^4.

In the modern orchestra there are always two, and often three flutes. When three are required, the third flute is generally the small flute or *piccolo* (q.v.). Its tones are very shrill and can be employed effectively only in *fortissimo* passages. Before Böhm had perfected the modern flute the *flûte à bec* was used extensively. This instrument had a mouthpiece like the clarinet, and was played in a vertical position. (See FLAGEOLET.) If in scores written before the middle of the eighteenth century the name *flauto* occurs, it is always the flûte à bec that is meant.

FLUTE. The bellows-mender in Shakespeare's *Midsummer Night's Dream,* who plays the part of Thisbe in the humorous play supposed to be given before Theseus and Hippolita.

FLUTE-BIRD (so called from its clear note). An Australian shrike (*Gymnorhina tibicen*). See PIPING-CROW.

FLUTEMOUTH. See SNIPEFISH.

FLUTE-SHRIKE. One of the brightly colored African shrikes of the genus Laniarius, so called from the clear whistle uttered by all of the species, one of which is locally called 'canariebyter' because it preys upon certain small birds locally known as canaries.

FLUTING. The moldings in the form of hollows or channels cut vertically on the surface of columns. They were adopted by the Greeks as ornaments to their Doric, Ionic, and Corinthian columns, and were retained by the Romans in their architecture. The Tuscan is the only style without flutes. In Doric there are usually twenty flutes on the circumference, and the curves meet with a sharp edge. These curves, in Greek Doric, are elliptical, and they are carried up across the necking to the base of the cap. In the other styles there are regularly twenty-four flutes on the circumference. These are semicircular, and are separated by a vertical band; and, before reaching the necking and the base, are terminated with semicircular top and bottom. Flutes are said to be cabled when they are filled in to about one-third of their height from the base with a convex bead. This is done to strengthen the column and protect the flutes. In countries where Roman remains were abundant, as in the south of France, fluting was sometimes adopted by the early mediæval architects, as at Arles and Autun. In Italy, also, traces of this decoration are visible during the Middle Ages; but the flutes soon ceased to be vertical, and in Romanesque architecture (q.v.) assumed many varieties of forms, such as curves, zigzags, etc., twisting round the shafts.

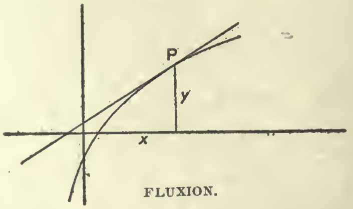
FLUT'TER. A gossiping fop in Mrs. Cowley's comedy *The Belle's Stratagem.*

FLUTTER, Sir Fopling. An affected beau, the hero of Etherege's comedy *The Man of Mode,* designed to ridicule Hewit, a fop of the period.

FLUX (OF. *flux,* from Lat. *fluxus,* a flow, from *fluere,* to flow). The name given to substances which facilitate the reduction of ores and the fusion of metals and other bodies fusible with difficulty. The name 'white flux' is applied to a mixture of the carbonate and nitrate of sodium or potassium. 'Black flux' is prepared by heating in close vessels ordinary cream of tartar (bitartrate of potash) with half its weight of potassium nitrate, when an intimate mixture of finely divided charcoal and carbonate of potash is obtained. The latter flux, when mixed with finely divided metallic ores, and the whole raised to a high temperature in a furnace, is not only useful in removing the silica, which the carbonate of potash it contains enables it to do, but the charcoal withdraws the oxygen from the metallic oxide and causes the separation of the pure metal. Limestone is employed as the flux in the smelting of iron ores. Other fluxes are fluor-spar, borax, oxide of lead, etc. See Iron and Steel; Copper, etc.

FLUX, or Profluvium. A discharge, generally from a mucous membrane. This old term is applied to all abnormal fluid evacuations from the body, but especially to those from the bowels and from the uterine organs. Dysentery (q.v.) was long termed 'the bloody flux,' to distinguish it from simple diarrhœa. See also Diarrhœa; Menstruation.

FLUXIONS. The name 'method of fluxions' was given by Sir Isaac Newton to his calculus, and was generally employed in England and America until well along in the nineteenth century. The name, the symbolism, and the fundamental idea upon which the method rests, were then supplanted by those of the Leibnitz calculus. Newton defined a 'fluent' as a quantity considered as gradually and indefinitely increasing (flowing, fluxing), and added: "The velocities at which these fluents move I call fluxions"—"*Quas Velocitates appello Fluxiones, aut simpliciter Velocitates vel Celeritates.*" (Colson edition, London, 1736, vol. i., p. 54.) Briefly, his plan was this: Consider a curve described by a moving point P = (x, y), and let the rate at which x increases (flows, fluxes) be designated by $\dot{x}$, and be called the fluxion of x. In the same way let $\dot{y}$ be called the fluxion of y. Then $\frac{\dot{y}}{\dot{x}}$ is the tangent of the angle made by the tangent to the curve at P, with the x-axis. It is therefore seen that $\frac{\dot{y}}{\dot{x}}$ is merely the $\frac{dy}{dx}$ of the Leibnitz calculus. The fundamental objection to the principle is that it is based upon the idea of velocity, which involves that of time. To this objection must be added that of the unfortunate notation employed by Newton. While this has some advantages in certain problems in physics, it becomes unwieldy when one desires to express successive differentiations. The method of fluxions was used by Newton as early as 1666, and is found in the MS. of his *De Analysi per Æquationes Numero Terminorum Infinitas,* which was circulated among his students in 1669, and in the *Methodus Fluxionum et Serierum Infinitarum,* which he wrote about 1675. The term 'fluxion' seems to have been suggested to him by Cavalieri's work. See Calculus; Newton.



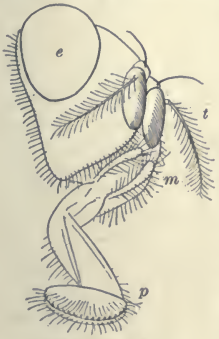
FLUXION.

FLUXION TEXTURE. See Igneous Rocks.

FLUX OF LIGHT. See Photometry.

FLY (AS. *flēoge,* Icel. *fluga,* OHG. *flioga,* Ger. *Fliege,* from AS. *flēogan,* to fly, Icel. *fljuga,* OHG. *fliogan,* Ger. *fliegen;* ultimately, perhaps, connected with Lat. *pluma,* feather). An insect of the group which constitutes the order Diptera, a group of very great extent and of great economic importance. Members of the order are characterized mainly by having only two wings, the hind wings being so abbreviated as to be represented only by two small, slender rods known as halteres, or poisers, believed to be of service in assisting the insect to keep its balance and direction in flight. The only other insects which possess but two wings are the males of scale-insects of the family Coccidæ. The mouth-parts of the Diptera are fitted for sucking and piercing, but not for gnawing.

Reproduction. The flies form a very large group, comprising more than 40,000 described species, and in number of individuals it is unexcelled by any other group of insects from the prolificacy and rapid breeding of the many forms. Some curious biological phenomena occur in this group. In a great many flies, for example, the eggs hatch within the body of the insect, and the living larvæ are deposited. With the group known as the Pupifera, even the larval development is undergone in the body of the female, and the insect is deposited in the pupal condition. The extraordinary phenomenon known as pædogenesis also occurs, and the larvæ of a certain midge are known to give birth to young while yet in the larval condition. The metamorphoses of dipterous insects are more complete than those of any other order of insects. The larva is commonly termed a grub, or maggot, and is footless and frequently almost structureless. In many species the duration of the larval stage is very short. The maggot feeds voraciously, grows with extraordinary rapidity, and transforms to pupa either within the last larval skin or into an appendage-bearing pupa similar to that of certain Hymenoptera or Lepidoptera. The different forms vary greatly in habits. Very many are feeders on decaying animal and vegetable matter. Others are parasites on warm-blooded animals. Many forms are aquatic. Others feed upon living vegetation, while others form galls upon different plants. Among the plant-feeding flies, some species have high rank as injurious insects, as the Hessian fly and the onion-maggot, the apple-maggot, and others, while whole regions are rendered almost uninhabitable by the presence of forms which annoy men and animals.



HEAD OF A FLY.

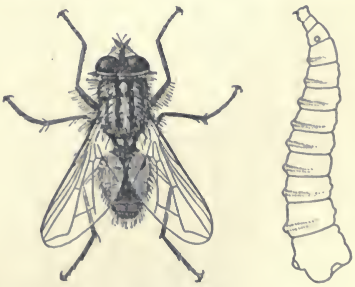
Musca vomitoria: *E*, eye; *t*, antennæ; *m*, maxillary palpi; *p*, labium or 'proboscis.'

Habits and Economy. Adult flies vary greatly in structure and in habits. With some the mouth-parts are fitted for piercing the skin of warm-blooded animals—the mosquitoes and the gadflies, for example, are especial torments of men and animals. The discovery that certain dipterous insects are important factors in the transfer of disease has rendered them the subject of special study of late years. The function of certain mosquitoes in the transfer of yellow fever and malaria, the transfer of anthrax by certain gadflies, the carriage of the germs of an African fever by the tsetse-fly, the conveying of the germs of the purulent ophthalmia of the Eyptians and Fiji Islanders by the house-fly, the transfer of the germs of typhoid fever and cholera by flies, and the spread of the disease known as pinkeye in the Southern States by midges, are all instances of this maleficent function. Detailed information may be found in Howard, *Carriage of Disease by Flies* (Agricultural Department, Washington, 1901).

On the other hand, the Diptera do perform, in many cases, beneficent services to their fellow-creatures. Many forms frequent flowers, and are important agencies in the cross-fertilization of plants.

Edible Flies. That flies should furnish human food is one of the most curious features of their history. Small species of the trypetine genus Ephydra, allied to the cheese-skippers, inhabit some alkaline lakes of the western United States and Mexico in enormous swarms. Such is the case in Lake Mono, California, whose water is so dense with salts that no fish or amphibian can live in it. The Ephydra flies resort there in countless swarms, dropping their eggs, and the larvæ develop so numerously that they drift in heaps along the shore, and at the proper season used to be gathered for food by the Indians, who would come long distances for the purpose. The grubs were dried in the sun on blankets, and then rubbed in the hands to remove the shell, when there remained a yellowish kernel like a grain of rice, which was ground fine and baked into cakes. This food, called *koo-chah-bee*, is oily, nutritious, and not unpleasant in taste. The species is *Ephydra Californica.* A similar preparation, under the name of *ahuatle*, is made from the eggs of *Ephydra hians* in Mexico. These eggs are laid on sedges, which the natives about Lake Texcuco purposely set afloat. The sedges are then collected and beaten over a cloth, knocking the eggs off, which are then cleaned and ground into a flour. The larvæ of these flies are also eaten under the name of *puxi.*

Classification. The difficulties in the systematic study of the Diptera are very great, and in many groups the species or number of families have not been well worked up, on account of the difficulty of preserving specimens, since they are so slender and fragile. It is probable that not more than a quarter of the species in existence have been named and classified, and Dr. Howard estimates that the order includes no less than 350,000 species. The latest comprehensive study in this direction has been made by M. D. Coquillett, of the United States Department of Agriculture, who divides the order into two suborders:



HOUSE-FLY.

The adult house-fly (*Musca domestica*) and its full-grown larva.

I. *Eproboscidea*, embracing only the parasitic pupiparous families Hippoboscidæ (see Forest Fly) and Nycteribiidæ (bat-ticks), whose proboscis is never furnished with terminal lips; and

II. *Proboscidea*, embracing all other flies never parasitic on mammals, birds, or honey-bees, and having the proboscis terminating in lips, and oviparous or larviparous.

In the suborder Proboscidea he finds two sections—(1) Orthorhapha and (2) Cyclorhapha. In the first are placed such slender, elongated, often long-legged groups as the crane-flies, midges, mosquitoes, moth-flies, snipe-flies, and gnats, together with the more robust families of March flies, gad-flies, bee-flies, robber-flies, and their immediate allies. In the second section will fall the syrphus flies, the bot-flies, Tachnia flies, flesh-flies, house-flies (q.v.), dung-flies, fruit and gall flies, and several groups of small forms closely related thereto.

FOSSIL FLIES. Fossil flies or Diptera are less common than are representatives of the Coleoptera and Orthoptera, but more frequent than other insects. They appear first in the Liassic rocks, and continue through the Jurassic and Cretaceous; but the remains in these formations are usually poorly preserved. The Tertiary Diptera represent nearly all the modern families; those of the Tipulidæ (crane-flies), Bibionidæ (March flies), and Syrphidæ are most common. The amber of the Baltic region and the shales of Oeningen, Germany, are especially rich in dipteran fossils, and those found in the amber are usually most beautifully preserved. In North America, the shale beds at Florissant, Colo., are the most prolific sources, and have yielded more than 1500 specimens of Bibionidæ alone. None of the fossil Diptera present any striking departures from the modern types. Consult Scudder, "Systematic Review of Our Present Knowledge of Fossil Insects," in *Bulletin 31, Geological Survey* (Washington, 1886). See INSECT.

BIBLIOGRAPHY. Consult: Williston, *Standard Natural History,* vol. ii. (Boston, 1884); Williston, *Manual of . . . North American Diptera* (New Haven, 1896); Knobel, *Mosquitoes, Gnats, Crane Flies, Midges, and Flies of the Northern States* (Boston, 1897); Osten Sacken, *Catalogue of the Described Diptera of North America* (2d ed., Smithsonian Institution, Washington, 1878). Consult also general works mentioned under INSECTS, and special books and papers mentioned under such special articles as BOT; FLESH-FLY; FRUIT-FLY; GAD-FLY; GALL-INSECT; GNAT; HESSIAN FLY; HOUSE-FLY; MOSQUITO; ROBBER-FLY, etc.

FLY. A river of New Guinea, rising at the base of the Victor Emmanuel Mountains, in the British portion of the island, and flowing first southwest and then southeast, emptying into the Gulf of Papua (Map: East Indies, K 6). For a portion of its course it marks the boundary between British and Dutch New Guinea. Its two main tributaries are the Alice and Strickland rivers. The banks are covered with mangrove trees, and at its mouth there is a wide delta. It was explored by McGregor for over 600 miles, but its total length has never been ascertained.

FLY. An assistant of the innkeeper in Ben Jonson's comedy *The New Inn.*

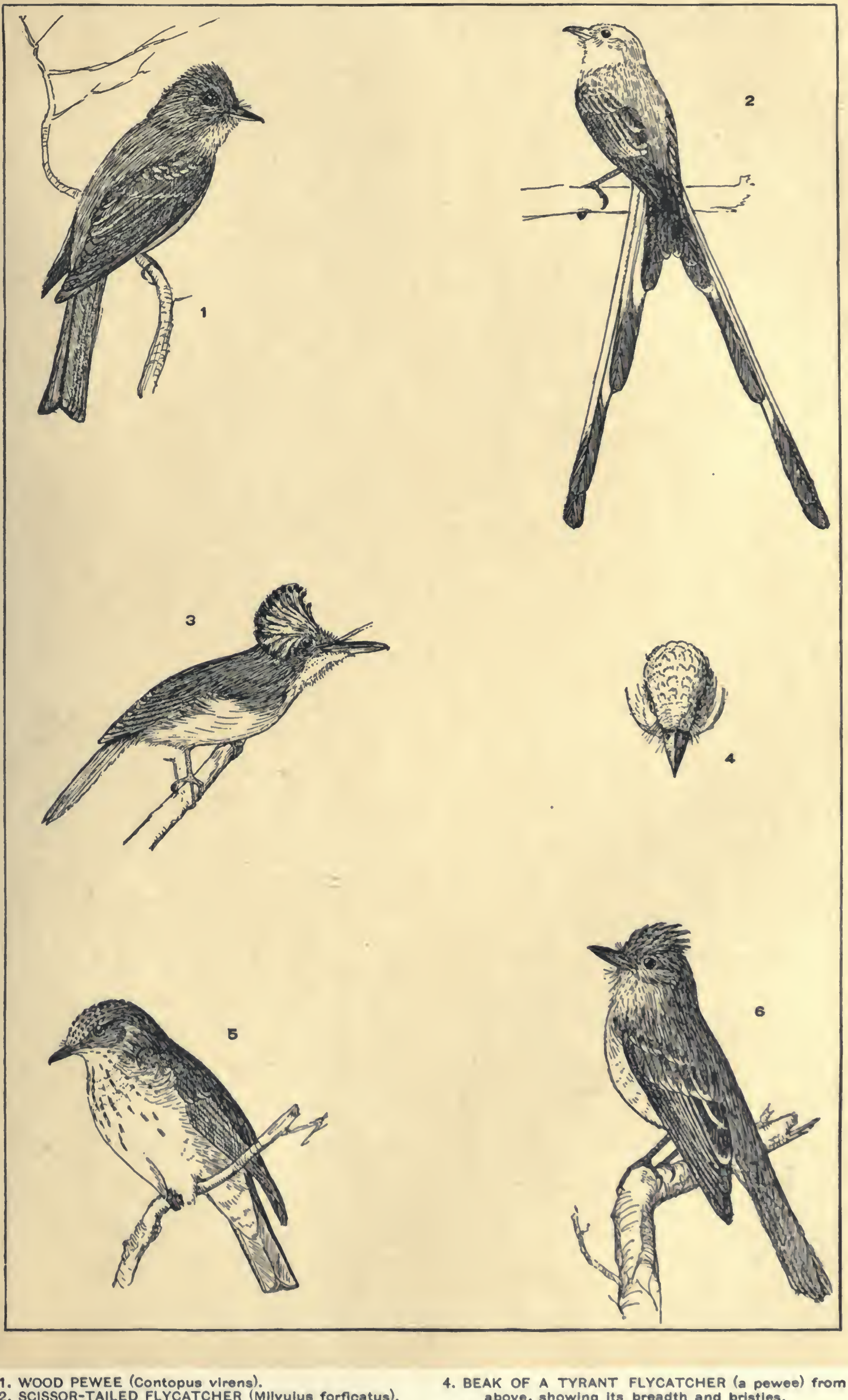
FLY-AG'ARIC. See AMANITA; FUNGI, EDIBLE AND POISONOUS.

FLY-CASTING. Of the three main methods of angling, casting the fly is the most scientific and universal. Its devotees are divided into two schools—the old-time or 'wet-fly' anglers, who whip the stream with a cast of flies, and shift from place to place; and a new school of 'dry-fly' anglers, so called because they use but one very small fly on their line, and that constructed with upright wings, so that when it drops on the water it remains dry and natural, and the angler, remaining stationary, waits for the rise. Both schools use in common a light, elastic, three-jointed rod, from 9 to 10 feet long, varying in weight according to the skill of the angler or the use to which it is to be put, from 3½ ounces upward. The line for trout is of waterproof silk, braided, of size F or G (the heavier being more easily cast); at the end of the line is attached a *leader,* made of single strands of clean, round, silkworm gut; to this is tied the fly, or two or three, according to the method of the angler. Leaders may be stained a neutral tint by soaking in a strong solution of green tea and kept between layers of damp felt. Before use soften again in water, or the gut may crack and become worthless. Beneath the rod, at the extreme end of the butt, should be fixed a steel-pivoted, single-action click reel. Casting the fly involves many intricate movements, to be perfected only by long practice. See FISHING; SALMON-FISHING; TROUT-FISHING.

FLY-CATCHER. (1) A name given to various birds of the order Passeres, but orignally applied to those of the thrush-like family Muscicapidæ, having a moderately long, angular bill, broad and depressed at the base, compressed and slightly curved at the point; the base surrounded with stiff hairs or bristles directed forward, which help to secure insect prey. The legs and feet are small; the outer toe the longest, and attached to the middle one as far as the first joint. The wings are not long; their first quill-feather is very short; the third is the longest. The birds of this family, as now restricted, are exclusively confined to the Old World, and mostly to the warmer parts of it. The true fly-catchers all have the habit of remaining perched for a long time in the same spot, only leaving it to make a sudden dart at a passing insect, which is seized with a snap of the bill, and then returning. They are almost never to be seen running on the ground, or even on the branches of trees, and do not chase insects in the air like swallows. Even in the restricted use of the name the Muscicapidæ include about 400 species, arranged in nearly 60 genera. Only four species are European, two of which are British—the spotted fly-catcher (*Muscicapa grisola*) and the pied fly-catcher (*Muscicapa atricapilla*)—birds about the size of a sparrow, the former of which is common in most parts of England as a summer bird of passage, but rare in Scotland; the latter is rare in Great Britain, although abundant in the south of Europe. The spotted fly-catcher is brownish-gray above, white beneath, the head and breast marked with dusky spots. Its call is a mere chirp. It is remarkable for the choice it makes of situations for its nest, often on a beam in an outhouse, on the side of a faggot stack, on the branch of a tree trained against a building, and sometimes even on a lamp-post in a street. It has been observed that a single pair of spotted fly-catchers feed their young no fewer than 537 times in one day, and that their motions are so rapid that, to count the number of visits accurately, the observer must not take his eye off the nest for a moment.

(2) The name fly-catcher is often extended to birds of similar habits belonging to other families. In America the name is universally applied to the birds of the family Tyrannidæ, often styled 'tyrant fly-catchers.' This family is peculiar to America, and contains some 350 species, of which

TYPICAL FLYCATCHERS



1. WOOD PEWEE (Contopus virens).
2. SCISSOR-TAILED FLYCATCHER (Milvulus forficatus).
3. CROWNED TYRANT FLYCATCHER (Muscivora Mexicana).
4. BEAK OF A TYRANT FLYCATCHER (a pewee) from above, showing its breadth and bristles.
5. SPOTTED FLYCATCHER (Muscicapa grisola).
6. GREAT-CRESTED FLYCATCHER (Myiarchus crinitus).

about one-tenth occur in the United States. They are more or less solitary and sedentary in their habits, and feed like the true fly-catchers. The shape of the wings and tail enables these birds to twist and turn in the air with remarkable agility and grace. The fly-catchers, being entirely insectivorous, are necessarily migratory in most parts of the United States. They have no power of song, but their notes are characteristic, and in some species not unmusical. The colors are generally dull, though some of the tropical forms offer striking exceptions. Among the numerous remarkable birds of this family can be mentioned only a few genera: Tyrannulus, notable for the diminutive size, the type species being less than three inches long; it is found in northern South America. Todirstrum, small, very brightly colored South American species, with a bill like that of a tody (q.v.). Fluvicola, small black and white birds of the South American pampas, called water-caps, because of their fondness for water. Pitangus, the large derby fly-catchers of Mexico, nearly a foot long. Milvulus, the graceful and striking swallow-tailed fly-catchers, in which the tail is very long and deeply forked, as in the barn-swallow; they are found in tropical America, but one species is common in the Southern United States, especially Texas. Among the common fly-catchers of the eastern United States may be mentioned the kingbird (q.v.); the least fly-catcher (*Empidonax minimus*), called 'chebec,' from its characteristic note; the small green Acadian and Traill's fly-catcher, or 'pewees'; the olive-sided fly-catcher (*Contopus borealis*), a very solitary but noisy woodland species nowhere very common; and the great-crested fly-catcher (*Myiarchus crinitus*), a handsome woodland species with a loud and very characteristic note. See also KING-BIRD; PEWEE; PHŒBE; Plate of FLY-CATCHERS; Plate of EGGS OF SONG-BIRDS.

FLYING BRIDGE. See FERRY.

FLYING COLUMN. Usually a small army of cavalry and infantry, and, where possible, horse artillery, complete in itself, and carrying its own principal supplies. It is organized for rapidity of movement, freedom from all unnecessary impedimenta, and is comparatively independent of its original base of operations. It is generally used for imperative purposes, as the securing of strategical points, the relief of garrisons in extremities, or to circumvent some counter-move of the enemy. The most important instance of modern times was the flying column of British troops, organized after Maiwand, under General (now Lord) Roberts, who marched 300 miles in 20 days, fighting a decisive battle at the end of the march. The march was commenced on August 9, 1880, at Kabul, and carried out through a mountainous and hostile country.

FLYING DRAGON, or FLYING LIZARD. See DRAGON.

FLYING DUTCHMAN. According to the legend, the shade of the Dutch sea captain Van Straaten, condemned for his sins to sail the high seas in a spectral ship, the sight of which is a bad omen to sailors, who quickly change their course to avoid its fatal influence. The legend has its prototype in many tales of the German mythology, and similar stories are current in other countries. In England, Vanderdecken is the name of the captain, and the phantom ship is the exact image of a real vessel. This legend forms the subject of Wagner's opera *Der Fliegende Holländer* (q.v.).

FLYING FISH. A name given to all those fishes which have the pectoral fins so very large that by means of them they are sustained in short seeming flights in the air. These fishes belong to two very different families—Exocœtidæ and Cephalacanthidæ; but the name flying fish is sometimes limited to those of the former family, those of the latter being known as *flying gurnards* (q.v.). The true flying fish of the genus Exocœtus, in which the pectoral fins are nearly as long as the body, are numerous in species, and occur in most parts of the oceanic world. The one best known is that of the North Atlantic (*Exocœtus volitans*), which occurs abundantly in the open seas, is found on the coast of South Europe, and is not uncommon on the Atlantic coast of North America; it is also found near the Hawaiian Islands. It is dark brown, with an oblique whitish band from the axil back to the middle of the fin. (See Plate of NEEDLE-FISH.) Another common species of the Atlantic is *Exocœtus furcatus*, having about the same range as the above. The great flying fish (*Exocœtus Californicus*), common on the California coast, attains a length of 18 inches. The other species range from 6 to 12 inches in length. A somewhat different one is the sharp-nosed flying fish (*Fodiator acutus*), common on both sides of Central America. All these are good food-fishes, and the favorite food of many predatory fishes, such as bluefish, albacore, porpoises, etc., to escape which their flights are undertaken. Birds often seize them in the air, and they frequently leap on board boats and small ships.

Close observations of their method of flight have been made by Jordan and his assistants, Gilbert and Evermann, a summary of which is given in *Fishes of North America* (Washington, 1883), as follows: The flying fishes live in the open sea, swimming in large schools. They will 'fly' a distance of from a few rods to more than an eighth of a mile, rarely rising more than three or four feet. Their movements in the water are extremely rapid; the sole source of motive power is the action of the strong tail while in the water. No force is acquired while the fish is in the air. On rising from the water the movements of the tail are continued until the whole body is out of the water. While the tail is in motion the pectorals seem to be in a state of rapid vibration, but this is apparent only, due to the resistance of the air to the motions of the animal. While the tail is in the water the ventrals are folded. When the action of the tail ceases the pectorals and ventrals are spread and held at rest. They are not used as wings, but act rather as parachutes to hold the body in the air. When the fish begins to fall the tail touches the water, when its motion again begins, and with it the apparent motion of the pectorals. It is thus enabled to resume its flight, which it finishes finally with a splash. While in the air it resembles a large dragon-fly. The motion is very swift, at first in a straight line, but later deflected into a curve. The motion has no relation to the direction of the wind. When a vessel is passing through a school of these fishes they spring up before it, moving in all directions, as grasshoppers in a meadow.

For comparative descriptions of the species of flying fishes, consult Jordan and Meek, *Proceedings United States National Museum* (Washington, 1885). A very complete series of the American forms is in the Museum of the Academy of Natural Sciences at Philadelphia.

FLYING-FLIGHT, MECHANICAL. See AËRONAUTICS.

FLYING FOX. (1) A fox-bat. (See FOX-BAT.) (2) A flying lemur. See COBEGO.

FLYING FROG. A small frog, whose long toes are connected by membranes, and which makes sailing leaps from tree to tree. It belongs to the family (Ranidæ) of ordinary water-frogs, but is wholly arboreal in habit and forms the genus Rhacophorus, characterized not only by the webbing, but by the presence of a small additional bone between the last two joints of the toes, which terminate in disks. All are normally richly green (with yellow bellies), rendering them invisible amid the foliage; and, in addition, they possess in a high degree the power of changing their color (see METACHROSIS) to conform to the color of the surface they rest upon. Over forty species are known, most of which inhabit the Malay Archipelago, Ceylon, and the adjacent shores of Asia, while twelve species are natives of Madagascar. One of the best known is the Bornean species (*Rhacophorus pardalis*), discovered by Wallace. In this the webbing between the toes is extensive, all four together covering a space of about 12 square inches, and the fore legs are bordered by a membrane. In most of the other species the webbing is less extensive, and the distance they can glide through the air is correspondingly decreased. They breed in the water, like other tree-frogs, are mainly nocturnal in their movements, and the males are noisy. "The larvæ are remarkable for the possession of an adhesive disk behind the mouth on the under surface, while the muzzle is prolonged into a proboscis, and the single breathing pore is situated on the right side of the body, nearer to the tail than to the muzzle." Consult: Wallace, *Malay Archipelago* (New York, 1869); Tennent, *Ceylon* (London, 1859).

FLYING GECK'O. A small lizard, having a parachute, enabling it to sail through the air. see GECKO, and compare with DRAGON.

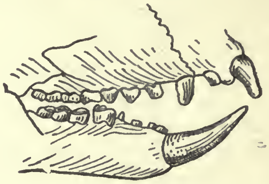
FLYING GUR'NARD, or **FLYING ROBIN.** A fish of the family Cephalacanthidæ allied to the gurnards or sea-robins (qq.v.), but remarkably distinguished by the great size of the pectoral fins, used for the same purpose and in the same way as the true flying fish. The pectoral fins are, however, of a very different appearance from those of the Exocœtidæ, widening almost to the end, which is rounded, and the tips of the rays extend considerably beyond the membrane. A very long spine points backward from the gill-cover on each side. The species are few in number, and all are pelagic. One (*Cephalacanthus volitans*) inhabits the middle latitudes of the North Atlantic, is usually about twelve inches in length, and has similar habits to those of the flying fish, but does not fly so well; it is often called 'batfish.'

FLYING JIB. See SAIL.

FLYING LE'MUR, or COLUGO. See COBEGO.

FLYING MACHINES. See AËRONAUTICS.

FLYING PHALAN'GER, or **MOUSE,** or **OPOSSUM.** The name given to various marsupial quadrupeds of the subfamily Petaurinæ, natives of New Guinea and of Australia, where they are generally called squirrels or flying squirrels. They are nearly allied to the phalangers (q.v.), but have not so long and prehensile a tail, while they are distinguished by a hairy fold of the skin along the flanks, used as a parachute. There are several different genera, of which Petaurista includes the large forms, some of which are 20 inches long besides the tail, and Acrobates includes the smallest forms, only three or four inches long. The flying membrane extends along both fore and hind legs almost to the toes, but does not appear behind the hind legs, nor include the tail, which is pretty long and bushy, but which in some of them has a distichous character, the hair spreading out to the sides, and so rendering it useful in supporting as well as in guiding the body in the air. They are capable of modifying their course in the air, although this is not in the nature of true flight; and their aërial evolutions are very graceful. They sleep during the day and become active in the evening. They feed on fruits, leaves, insects, etc. A New Guinea species is about as large as a flying lemur; one of the Australian species (*Acrobates pygmœus*) is scarcely larger than a mouse. and feeds on the nectar of flowers and some insects. The fur of some of them is rich and beautiful. 'Petaurist' has been proposed as an English name for these animals, but is not much used. See MARSUPIAL, and the authorities there cited.



DENTITION OF FLYING PHALANGER.

FLYING SPIDER. See SPIDER.

FLYING SQUID. A squid of the genus Ommastrephes, having a tail so large as to be able to leap out of the water, high enough sometimes to fall upon the decks of ships. They form a principal part of the food of many of the whales, and are often the prey of albatrosses, petrels, and other marine birds. Some species reach a length of several feet. See SQUID.

FLYING SQUIRREL, skwĕr'rĕl *or* skwĭr'rĕl. A squirrel which has a fold of the skin of the flanks (a 'parachute') extended between the fore and hind legs, and partly supported by bony processes of the feet, by means of which it is enabled to take extraordinary leaps, gliding for a great distance through the air. The distichous tail also aids to support it in the air, as well as to direct its motion. There are two genera, Pteromys and Sciuropterus. The former contains large species characteristic of the Indian and East Indian region; the latter contains the smaller species of North America, Asia, and Europe. The European species (*Sciuropterus volans*) is about the size of a rat, grayish ash-color above, white below, the tail only half the length of the body; it lives solitary in the forests. Its fur is of little value, but skins are sometimes mixed with those of the gray squirrel, to impose on the purchaser. The most common North American species (*Sciuropterus volucella*), common from the Gulf of Mexico to Upper Canada, is fully five inches long, plus a tail equally long. It is brownish-gray above, white beneath, and a black line surrounds the orbit of each eye. In the Yukon region of Alaska this species is replaced by a much larger one (*Sciuropterus Yukonensis*), but it seems to be a very rare animal.

All the flying squirrels inhabit woods, and the night is their time for activity. They feed not only on nuts and young shoots of trees, but also are said to kill and eat small birds, and to rob birds' nests. They are easy of domestication, but are apt to bite, and do mischief to furniture and hangings, especially by gnawing woolen stuffs to pieces as material for their nests. These are naturally placed in some cranny of a hollow tree, preferably a deserted woodpecker's hole, but may be placed within a house. In gliding from tree to tree the flying squirrel descends obliquely, and with very rapid motion, until near the tree which it seeks to reach, when it wheels upward, and alights on the trunk. Fifty or sixty feet is the ordinary length of its flight. See SQUIRREL, and the authorities mentioned thereunder; and Plate of SQUIRRELS.

The name is also applied in Australia to flying phalangers (q.v.), and in Africa to the scale-tailed squirrels of the family Anomaluridæ. These little creatures, which belong in West and Central Africa, much resemble American flying squirrels in appearance and habits, but the tail is more slender, and has on its inferior surface and margins, near the root, a series of large imbricated scales, that are of service in climbing; the parachute is distended and supported by a stiff cartilaginous process from the olecranon. Consult *Proceedings Zoölogical Society of London* (London, 1874-75).

FLY MUSHROOM, or **FLY AMANITA.** See AMANITA; FUNGI, EDIBLE AND POISONOUS.

FLYNT, JOSIAH (properly Josiah Flynt Willard) (1869—). An American sociologist and author, born at Appleton, Wis. He was educated at the University of Berlin in 1890-95, and after several years of experience as a professional vagrant published in 1899 *Tramping with Tramps*, a novel and picturesque study. His further works dealing with the lower and criminal classes include *The Powers that Prey* (1900), a collection of short stories written in collaboration with Francis Walton; *Notes of an Itinerant Policeman* (1900); *The World of Graft* (1901), also a volume of short stories; and *The Little Brother* (1902), his first sustained attempt in fiction.

FLY-SNAPPER. One of the names of a rare and very beautiful crested fly-catcher (*Phainopepla nitens*) of the southwestern United States. It is entirely rich lustrous black with steel-blue or greenish reflections; and with a large white space on the inner webs of the wing-quills. Its length is about seven and one-half inches. The female is brownish gray, but crested. It frequents bushes in the desert regions of Nevada, Arizona, and southern California. It also feeds extensively on various berries, and has, in short, much the habits and manners of a waxwing. Its customary note is described as a 'rattling call'; and it makes a rude nest in a bush or tree, and lays two eggs, greenish white, so thickly marked with dark brown and purple that some specimens seem almost totally black. Consult Coues, *Birds of the Colorado Valley* (Washington, 1878).

FLY-UP-THE-CREEK. A local name in the United States for the little green heron, or shitepoke (*Ardea virescens*), common throughout the United States and southern Canada. See HERON.

FLY-WEEVIL. A local name in the United States for the grain-moth (*Gelechia cerealella*). See GRAIN-INSECTS.

FLY-WHEEL. A heavy wheel attached to the revolving shaft of a steam-engine to serve as an accumulator and equalizer of power. Its action depends upon the mechanical law that a body once set in motion retains a certain amount of moving force or momentum which has to be overcome before motion ceases. Thus, a heavy wheel once set to rotating by some external force, as the piston-rod of a steam-engine, continues to rotate by virtue of its stored energy or momentum after this external force ceases to act. In a steam-engine the function of a fly-wheel is: (1) To store up excess of energy received from the piston during the first part of its stroke under full steam pressure, and to give it out when, during the latter part of the stroke, the effort has grown less because of decreased pressure due to the expansion of the steam; (2) to equalize the variation in the leverage with which the varying steam effort acts upon the crank to revolve the shaft; (3) to give out or absorb energy when variation in the external load or resistance occurs suddenly. The fly-wheel is, therefore, as described, an accumulator and an equalizer, and the reserve which it stores will be greater as its mass is greater, and the leverage greater with which that mass acts. Large mass means great weight and consequently great friction on the shaft-bearings. Large leverage or large radius means more space required for the wheel and increased centrifugal force tending to disrupt its rim. The designer of a fly-wheel has to integrate these different factors to meet the requirements of space, speed of rotation, and other governing conditions. Modern practice shows a tendency to adopt smaller diameter wheels than was once customary; in early engines 30-foot fly-wheels were often to be met, but now 18 to 20 feet are large diameters, and in centre-crank high-speed engines six feet has become a large size. The strains which are set up in a fly-wheel because of the work which it has to do are, first, a torsional strain tending to twist the spokes off the hub, and second, a strain due to centrifugal force which tends to burst the rim. A fly-wheel can easily be designed to resist torsional strains, but there is no possible way to overcome the centrifugal force, hence for a given material there is a definite speed at which disruption will occur regardless of the amount of material used. A recent authority gives the following simple formula for figuring the disrupting speed of fly-wheels having solid, single-piece rims:

$$v = 1.6\sqrt{\frac{s}{w}}.$$

In this formula v represents rim-speed in feet per second at which disruption occurs, s represents the ultimate tensile strength of the material per square inch, and w represents the weight of the material per cubic inch. If, instead of ultimate strength, we let s represent the safe strength, then by solving the equation for v we get the safe rim-speed in feet per second. If the wheel is made of sections bolted together, the ultimate and safe values of s in the above formula must be reduced to from one-half to one-fourth of the figure assumed for solid wheels. The safe rim-speed of a solid cast-iron wheel figured according to this formula is about 100 feet per second, of a cast-steel wheel about 233 feet per second, and of a maple-wood wheel about 155 feet per second.

The disruption or bursting of a fly-wheel revolving at high speed occurs with great force, the flying fragments often wrecking the engine and building in which it is housed, and sometimes being thrown several hundred feet away. Fly-wheel accidents are less common than formerly, but are still frequent enough to make the designing of strong and safe wheels a problem for serious study by engineers.

In early engines turning with a low number of revolutions the fly-wheel required to be of large diameter, and was for this reason nearly always distinct from the wheel from which the power was taken off. In more modern engines the convenience of having the fly-wheel serve also as an element of the transmission machinery has brought about the use of fly-band wheels, where belts or ropes are used to take off the power from the engine-shaft. It is so much less the practice in recent years to use gearing in transmitting the power from the engine-shaft that the fly-wheel is seldom a toothed wheel. Small fly-wheels are usually made in one piece of cast iron or cast steel. Larger sizes are cast in halves, which are connected by bolted joints to form the complete wheel, and the largest wheels are cast in several segments which are bolted together. Fly-wheels are sometimes made with metal hub and arms and a rim of some tough, hard wood. Other constructions are steel plates riveted together, and cast wheels with their rims wound with steel wire of great strength. (See Steam-Engine.) Very complete data for use in the calculation and design of fly-wheels will be found in Kent's *Mechanical Engineer's Pocket-Book* (New York, 1902).

FO. The Chinese equivalent for Sanskrit Buddha. See Buddhism.

FOA, fȯ-ȧ′, Eugénie (1798-1853). A French romance writer, born at Bordeaux. She was by descent a Spanish Jewess, and her maiden name was Gradis. She married young, but soon left her husband, and despite delicate health and failing eyesight, she supported herself by her pen, using at times the nom-de-plume 'Maria Fitzclarence.' Madame Foa's latest and most successful books were: *Les mémoires d'un polichinelle* (1839); *Le petit Robinson de Paris* (1840); and *Le vieux Paris* (1840). She wrote charming tales for young people, with the moral not unduly prominent.

FOCAL LINES. See Focus; Light.

FOCI (Neo-Lat. nom. pl., points, from Lat. *focus*, hearth, ML. central point). Points the distances of which from any point on a given curve are connected by a definite relation. In the case of conics, the foci are points on the principal axis, such that the corresponding double ordinate is equal to the parameter of the curve. The term focus, used in this sense, is due to Kepler (1604). By varying the values of the constants in the equation $y^2 - m^2x^2 = 2px$, it may be made the equation of an ellipse, parabola, or hyperbola, according as m^2 is $< 0, = 0$, or > 0. The abscissas of the foci will be found by substituting $y = p$ in the equation of the curve, whence

$$x = \frac{-p(1 \pm \sqrt{m^2+1})}{m^2}$$

From these values of the abscissas, considering m^2 as positive, zero, and negative successively, we see that the ellipse and hyperbola have two finite foci, while the parabola has one finite focus and one at infinity. The name focus was originally given to these points from the fact that rays of light emanating from either focus are reflected by the curve through the other. The distance from the foci of curves to every point of the curve can be expressed rationally in terms of the abscissas of the points—a unique property. Curves of higher degree may have several foci. (See Cartesians.) The foci of a conic possess the property that the straight lines which connect them to the circular points at infinity are tangents to the curve. In general a point P is said to be a focus of a curve when the lines connecting this point with the circular points at infinity are tangents to the curve. A curve of the nth class has n^2 foci, but the curve being real, n and only n of these foci are real. See Curves; Ellipse; Parabola.

In optics, the term focus is employed to designate a point at which rays meet and are collected, after being reflected or refracted. A point from which rays appear to come after reflection or refraction is termed a 'virtual focus.' The 'principal focus' is the focus of parallel rays after reflection or refraction. See Lens; Mirror; Catoptrix; Light.

FOCUS. See Foci.

FODDER. See Feeding Stuff.

FODDER, Green. See Silage.

FŒDERA, fĕd′ẽr-ȧ (Lat., treaties). A collection of documents bearing on State transactions between the Kings of England and others from 1101. Fifteen volumes were compiled by Thomas Rymer (q.v.) from 1693 to 1713, and after his death five volumes were used by Robert Sanderson (1715-35), covering the documents down to 1654. The work as abridged in a French version by Rapin was retranslated into English by Stephen Whatley, under the title, *Acta Regia* (1731).

FŒTUS (Lat., offspring). The term applied to the unborn young of viviparous animals, especially in the more advanced stages. In the human subject the term fœtus is applied to the embryo, though more often to the unborn child after the end of the fourth month, when human features are distinguishable. The *fourth-month* fœtus weighs about five ounces, and is about six inches long; its brain convolutions are found to be developing, and its sex is recognizable; its muscles are capable of producing movements of the limbs, and its extending ossification can be traced in the bones of the skull. The *fifth-month* fœtus weighs about ten ounces, and is about ten inches long;

hair and nails appear, and ossification in the ischium takes place in course of the fifth month. The *sixth-month* fœtus weighs about one pound, and is eleven or twelve inches long; its eyelids, with eyelashes formed, are closed; fat gradually develops under its skin, and its pubic bones undergo ossification. The *seventh-month* fœtus weighs from three to four pounds, and is from thirteen to fifteen inches long; its skin is covered with sebaceous matter, and the fat under its skin attains to a considerable amount; its eyelids are open. The *eighth-month* fœtus weighs from four to five pounds, and is from sixteen to eighteen inches long; its nails are completely developed, and the membrana pupillaris has disappeared. The *ninth-month*, or full term, fœtus weighs from five to nine pounds, or six and one-half pounds on an average, and is from seventeen to twenty-one inches long. The average weight and length of the male infant slightly exceed those of the female, even at birth; the average excess in weight is about twelve ounces, the average excess in length about 4.8 inches. Clark observes that if, at the full term, the weight of the infant is less than five pounds it rarely thrives, though a few cases are recorded of surviving children who weighed one pound at birth. On the other hand, various instances are recorded of infants in which the weight at birth exceeded twice the average weight. There are certain points in which the fœtus at the full period differs anatomically from the child shortly after birth. The bony skeleton is very incomplete, cartilage occurring in the place of many bones. Indeed, complete ossification (e.g. of the vertebræ) is not finished until about the twenty-fifth year, and the only bones completely ossified at birth are the minute ossicles of the ear. The difference between the fœtus and the child in this respect is, however, only one of degree.

During pregnancy, a temporary organ, termed the placenta (popularly known as the afterbirth, from its being delivered shortly after the child), is developed on the inner wall of the uterus. This organ is mainly composed of vessels, and there proceeds from it the structure known as the umbilical cord, in which lie the umbilical vein, which conveys arterial blood to the fœtus, and the two umbilical arteries, which return the blood to the placenta. This umbilical cord conveys these vessels to the umbilicus, or navel. In the heart we find a communication between the two auricles by means of an opening termed the *foramen ovale*. In the arterial system we have to notice, first, the *ductus arteriosus*, which is a large communicating trunk between the pulmonary artery and the descending aorta; and, secondly, the branches given off by the internal iliac arteries, which go under the name of hypogastric as long as they are within the body of the fœtus, and of umbilical when they enter into the structure of the cord, and are continued from the fœtus to the placenta, to which they return the blood which has circulated in the fœtal system. In the venous system there is a communication between the umbilical vein and the inferior vena cava, called the *ductus venosus*.

Pure blood is brought from the placenta by the umbilical vein, which passes through the umbilicus, and enters the liver, where it divides into several branches, which are distributed to that viscus, the main trunk, or *ductus venosus*, passing directly backward, and entering the inferior vena cava. The pure blood here becomes mixed with the impure blood which is returned from the lower extremities and abdominal viscera, and is carried into the right auricle, and from thence, guided by the Eustachian valve (which is situated between the anterior margin of the inferior cava and the auriculo-ventricular orifice, and is of relatively large size in the fœtus), passes through the *foramen ovale*, into the left auricle. From the left auricle it passes into the left ventricle, and into the aorta, whence it is distributed by the carotid and subclavian arteries principally to the head and upper extremities, which thus receive comparatively pure blood. From the head and arms the impure blood is returned by the superior vena cava to the right auricle; from the right auricle, it is propelled, as in the adult, into the right ventricle; and from the right ventricle, into the pulmonary artery. In the adult, it would now pass through the lungs, and be oxygenized; but in the fœtus it passes through the *ductus arteriosus* into the commencement of the descending aorta, where it mixes with that portion of the pure blood which is not sent through the carotid and subclavian arteries. Some of this mixed blood is distributed by the external iliac arteries to the lower extremities, while the remainder (probably the larger portion) is conveyed by the hypogastric or umbilical arteries to the placenta. Almost immediately after birth, the *foramen ovale* becomes closed by a membranous layer, and the *ductus arteriosus* and *ductus venosus* rapidly close, and degenerate into impervious fibrous cords. The lungs, previously to the act of inspiration, are dense and solid in structure, and of a deep-red color, and lie far back in the chest. Their specific gravity is greater than water, in which they (or portions of them) consequently sink, whereas lungs, or portions of lungs, that have respired, float in that fluid.

Children born in the seventh month of gestation are capable of living, although they usually require much care; and children may be born alive at any period after the beginning of the sixth month, or even in some instances earlier than the sixth, but this is rare, and if born living, they commonly die soon after birth. See GESTATION; EMBRYO; EMBRYOLOGY, HUMAN.

FOG, or **MIST** (Dan. *fog*, Icel. *fok*, spray, from *fjūka*, to be driven by the wind). Anything that obscures the clearness of the atmosphere, but specifically in meteorology the obscuration caused by the very minute globules of water floating in the air. Because of their minuteness, the fog particles have not sufficient weight to descend rapidly in the presence of the atmosphere; they are not hollow vesicles or spheres having an inherent buoyant gas, as was once supposed, but are upheld by the slightest currents of air; the slowness of their progress downward is due mostly to the viscous resistance or internal friction of the air. These particles of water represent the condensation of vapor that was invisible a short time before. This has been condensed into fog particles not by coming in contact with or by passing over colder bodies, but either by radiation of heat or by expansion and dynamic cooling. The latter is more frequent in the case of high fogs, but the former in the case of the ordinary fogs at sea-level. In general, when a mass of warm moist air rolls over cold land or cold water it radiates its warmth downward to the colder layers. On the other hand, when cold air flows over warm land or water the vapor rising from the latter is also quickly condensed, as it cools both by contact and by radiation. Thus fogs are formed over lakes, rivers, and marshes in the evening when the warm vapor from these penetrates the colder air above. Whenever cold dry air from the American continent flows southeastward over the Gulf Stream, fogs are formed. Or whenever cold and warm streams of water lie adjacent to each other, the air from the warmer, moister region is carried over to the cold water, and cools by radiation until fog is formed. The densest fogs off the eastern coast of New England and Newfoundland come with an east or southeast or southwest wind. Those on the Pacific Coast of California come with the west and northwest winds. The light morning fogs over grassy plains and swamps are due to cooling by radiation, and occur in still, clear weather within areas of high pressure.

The fog known as London fog, or dry fog, is due principally to the condensation of aqueous vapor upon the immense number of nuclei floating in the atmosphere as smoke from the soft-coal fires. In general, every particle of fog has a minute nucleus of dust or germs, or other solid particles, so that it is often injurious to health to inhale it. (See Dust.) In London the deaths during foggy weeks always exceed those during pleasant weather. See Fog-Signals.

FOGARASSY, fô′gŏ-rŏsh-ė, János (1801-78). An Hungarian jurist and philologist, born at Käsmark (County of Zips). In 1829 he was admitted to the bar, in 1848 became Councilor in the Hungarian Finance Ministry, and subsequently president of the Council of Commerce, and a judge of the Supreme Court. He wrote on Hungarian jurisprudence and finance (*The Hungarian Law of Trade and Exchange*, 1840; *The Hungarian Bank*, 1848); but is best known for the great *Dictionary of the Hungarian Language* (6 vols., 1861-74), prepared under the auspices of the Hungarian Academy of Sciences (from 1861 to 1866 in collaboration with Gregory Czuczor). This work is very inclusive, and continues to be regarded as standard, despite the fact that it is often at variance with the principles of modern philology.

FOGAZZARO, fō′gȧ-tsä′rô, Antonio (1842—). An Italian novelist and poet, born at Vicenza. He first attracted attention by a poem, *Miranda* (1874), which was followed by a collection of lyrics, entitled *Valsolda* (1876). Afterwards he wrote many novels, which have placed him among the first Italian writers. He has much dramatic invention and imagination, and his outlook is more spiritual and his tendency more idealistic than either D'Annunzio's or Farina's. Among his works, many of which have been translated, are: *Malombra* (1882); *Un pensiero di Ermes Torranza* (1882); *Il fiasco del maestro Chieco* (1885); *Daniele Cortis* (1887), his best story; *Fedele* (1887); *Il misterio del poeta* (1888); *Eva* (1892); *Il piccolo mondo antico* (1896); *Per la bellezza di un' idea* (1892); and *Alla vigilia* (1896). For his biography, consult Molmenti (Milan, 1900).

FOG-BOW. A white halo formed in or on the surface of a bank of fog. See Halo.

FOGELBERG, fō′gel-bĕrk, Bengt Erland (1786-1854). A Swedish sculptor, born at Gothenburg. He began to study at the Academy of Stockholm, and then went to Paris (1820), and studied painting under Guérin and modeling under Bosio. Subsequently he went to Rome, where he produced a statue, "Mercury" (1825), which was praised by Thorwaldsen, and his talent won immediate recognition. He was appointed Court sculptor by King Charles XIV., and for him executed his statue of "Odin." Upon his return to Sweden Fogelberg was received with great honor, but his health failed, and at the height of his fame he died suddenly at Triest. The variety of his subjects and the originality of his conception have made him rank among the first artists of his country. Others of his works are: "Thor and Baldur" (1842); "Love, the Conqueror" (1831); "Venus Victrix" (1839); statues of Charles XIII., Charles XIV., and Gustavus Adolphus (1849); and "Birger Jarl" (1853), on the Place Ridderholm, Stockholm. Consult Leconte, *L'œuvre de Fogelberg* (Paris, 1856).

FOGGIA, fŏj′å. A flourishing city in South Italy, capital of the Province of Foggia, 123 miles northeast of Naples (Map: Italy, K 6). The Norman cathedral was partly destroyed by an earthquake in 1731; it was afterwards rebuilt in modern style. Piazza Frederico Secondo, with its Emperor's Fountain, commemorates the fact that Frederick II. was often a resident. In 1240 he held a parliament here. The city has a beautiful custom-house, a theatre, a gymnasium, and other schools and public gardens, and a library. It is the principal market of Apulia, which produces wine, oil, grain, cattle, and capers. Population of commune, in 1881, 40,283; in 1901, 53,851.

FOG-HORNS. See Fog-Signals.

FOGLIETTA, fô-lyĕt′tå, Uberto (1518-81). An Italian historian. He was born in Genoa, of a noble family, and was educated at Padua and Rome. The publication of his first work, *Della repubblica di Genoa* (1559), caused his banishment from his native city and the loss of his estates, so that he spent the remainder of his life in Rome under clerical protection, and devoted himself to literature. Four volumes of his historical essays were published in Rome in 1579, under the title of *Clarorum Ligurum Elogia.* He wrote also *Historiæ Genuensium* (1585), which Serdanati translated into Italian, and other works of minor importance sufficient to place him in the front rank of Latin writers in Italy.

FO′GO (Port., fire; so called from the volcano in the island). One of the Cape Verde Islands (q.v.), lying west of Santiago. It has an area of 170 square miles, and about 16,000 inhabitants. The soil is productive, but the climate is unhealthful. Its volcano, the only active one in the group, is over 9000 feet high. Chief town and port, Nossa Senhora da Luz.

FOGO. A port of entry, capital of Fogo Island, at the southwest entrance to Notre Dame Bay, Newfoundland, 122 miles northwest of Saint John's. It is a busy fishing and trading port. Population, in 1891, 1020; in 1901, 1118.

FOG-SIGNALS. The chief use of fog-signals is to give facilities to approaching vessels when not in sight of one another, to enable them to continue their respective courses after having first localized the direction and distance of the neighboring ship. In addition, fog-signals are most useful indications of dangers to vessels approaching headlands or feeling their way through narrow channels.

In considering the first-mentioned use of the fog-signals, the International Marine Conference, held at Washington in 1890, concluded that all steam vessels should be provided with an efficient whistle or siren, sounded by steam or some subtitute for steam, so placed that the sound is not interrupted by any obstruction, and having an efficient fog-horn to be sounded by mechanical means, and also an efficient bell. In fog, mist, falling snow, or heavy rainstorms, whether by day or night, the following signals are to be used: A steam vessel having way upon her is to sound a prolonged blast at intervals of not more than two minutes. A steam vessel under way, but stopped and having no way upon her, is to sound at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between them. A sailing vessel under way sounds at an interval of not more than one minute, one blast when on the starboard tack, two blasts in succession when on the port tack, and three blasts in succession with the wind abaft the beam. A vessel at anchor is to ring her bell rapidly for about five seconds at intervals of not more than one minute. When a vessel anchors in other than ordinary anchorages, and is in danger of being an obstruction to vessels under way, if a steam vessel, she must sound two prolonged blasts with her whistle or siren, with not more than a two minutes' interval, followed by ringing her bell; if a sailing vessel, at intervals of not more than one minute, two blasts with her fog-horn, followed by ringing her bell. A vessel when towing, at intervals of not more than two minutes, sounds three blasts in succession, viz. one prolonged blast followed by two short blasts. A vessel towed can give this signal, but she cannot give any other. When one steam vessel wishes to indicate to another that she can feel her way past, she can do so by sounding a short blast, followed by a long and a short, with intervals of about one second between them. A cable-ship, at work, hearing another vessel's fog-signal, answers it with three prolonged blasts in succession.

A vessel under way, but not sufficiently under command to get out of the way of an approaching vessel, answers fog-signals by sounding four short blasts in succession. Sailing vessels and boats of less than twenty tons gross tonnage are not obliged to give the above; but if they do not they are to make some other efficient sound signal at intervals of not more than one minute. Every vessel in foggy, misty weather, or in snow or heavy rainstorms, is obliged by the rules adopted to go at a moderate speed, having careful regard to the existing circumstances and conditions. When a steam vessel hears, forward of her beam, the fog-signal of a vessel, the position of which is not ascertained, she must, as far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

Experiments made in Holland on the force and duration of sound signals show that a steam whistle two inches in diameter requires a pressure of about two atmospheres in order to make the sound heard at the distance of one kilometer (.62 mile); whereas a steam whistle of six inches diameter, with a pressure of six atmospheres, makes its sound heard about 14 kilometers (8.68 miles). If, however, the whistle be placed in a horizontal position within a reflector, the two-inch whistle can be heard at four kilometers (2.4 miles), which is about the same distance that a vessel's side-lights are visible. With a bell of 8 inches diameter sound travels only 600 meters (1868 feet), and it requires a bell of a weight of 80 kilograms (about 176 pounds) to transmit the sound 1500 meters (4920 feet). The sound of a movable bell (i.e. when the tongue or clapper is fixed) travels farther than when the reverse is the case.

On many points along the coast, in the lighthouses and on lightships, steam whistles and horns of great power have been placed, and also bells that are rung mechanically, which are sounded whenever the state of the atmosphere requires it to be done. The simplest and commonly most powerful signal employed by the United States Lighthouse Board is the locomotive whistle, operated by a steam boiler with a pressure of from 50 to 75 pounds. The sounds from the land are distinguished from those on board ship by the length of the notes and the intervals between. The whistles are from eight to ten inches in diameter, and are operated automatically by an engine supplied with steam from the same boiler. The Daboll trumpet, worked by condensed air, is next in importance. The trumpet itself provides the resounding cavity, and the vibratory motion of the air is produced by a reed. The reed is an iron bar, in the larger trumpets being eighteen inches long, two inches wide, and three-quarters of an inch thick, gradually lessening toward the free end. The siren trumpet is the most powerful instrument so far employed. (See SIREN.) The impulse to the air which produces the sound is given by a flat drum, or a hollow cylinder with a short axis, one end of which is perforated to admit steam. On the other side the drum is perforated with eight or more holes, in connection with which is a revolving disk having a similar number of holes. As the disk revolves these eight holes are alternately open and shut, allowing egress to as many jets of steam, which provides a regular and violent motion in the air, giving rise to a most powerful sound, reinforced by the resonance of a trumpet of suitable length. In still air this sound can be heard from 20 to 30 miles, even during a dense fog. The notes are not all to be heard at the same distance, however, and an opposing or crossing wind seriously interferes with the transmission of sound. The intervention of rain, snow, or mist also disturbs and retards, and temperature has a distinct influence. Whistling buoys and bell buoys are also largely used to mark dangers or channels, and are of great assistance in determining the whereabouts of a vessel in thick weather. For a thorough discussion of various forms of fog-signal, the reader is referred to Johnson, *Modern Lighthouse Service* (Washington, 1889).

Railway trains depend largely upon torpedoes to indicate the too close approach of one train to another. The torpedoes are small, flat tin cases charged with a detonating powder which is exploded by the wheels of the passing train and makes a loud report. These are not only used in foggy weather, but also when there is any obstruction along the line that would expose approaching trains to danger of collision, derailment, or any similar accident.

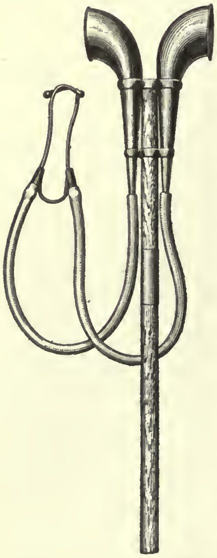


FIG. 1. TOPOPHONE.

While fog-signals have been made which may be heard at considerable distances, yet the apparent directions from which they come are often deceptive, and much of the good which might otherwise be accomplished by these signals is rendered nugatory because of the difficulty of locating exactly their direction. This has been measurably obviated by the invention of the 'topophone' by Col. D. P. Heap, Corps of Engineers, U. S. A. · This instrument not only assists in hearing sounds at greater distances than is possible with the unassisted ear, but also assists in locating with more exactness the direction from which the sound comes.

It consists of two acoustic receivers or trumpets pointing in opposite directions, and supported on a vertical shaft. (See Fig. 1.) From the lower ends of the trumpets extend rubber tubes connected with the ears by especially constructed ear-pieces.

The observer holds the shaft so that the instrument is above his head (see Fig. 2); if the sound is heard in the right ear, it shows at once that the noise must be somewhere on his right side. By oscillating the trumpet so that the sound is heard alternately in each ear, the sound will be in the direction inside of the angle of oscillation; this angle is generally about one point of the compass. The operation is simple and takes but a few seconds.

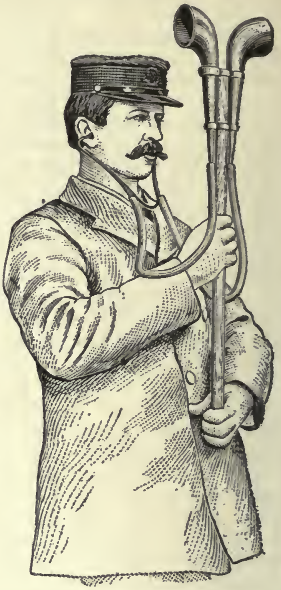


FIG. 2. METHOD OF USING TOPOPHONE.

The direction of the sound being once ascertained, the observer can readily keep the topophone pointed in this direction. Knowing the speed of the vessel and its course, the location of the sound can be quickly plotted accurately enough for practical purposes. This instrument cannot fail to be of very great value to those navigating ships, and accomplishes that which has long been sought for but not heretofore satisfactorily accomplished.

While the topophone above described aids to ascertain the direction of the sound, various attempts have been made to have direct indications of the approximate direction of the sound by varying its character for different points of the compass. The Foster fog-signals, which have been adopted by the United States Lighthouse Board, accomplish this. The apparatus is a species of sound-director, which concentrates and projects various signals, first in one direction and then in another, varying the signal sound according to the direction to which it is sent. A passing vessel may, therefore, hear one of these

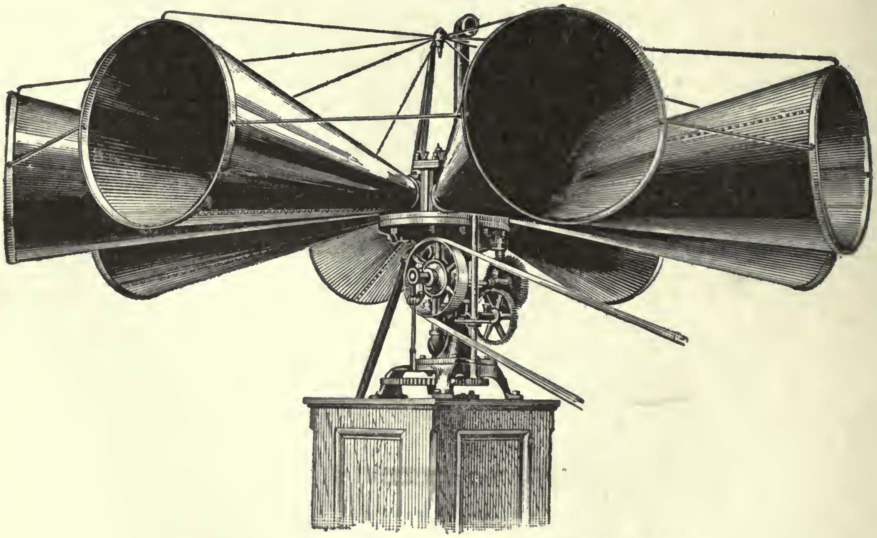


FIG. 3. LIGHTHOUSE MACHINE, WITH FIVE-FOOT MEGAPHONE.

sounds more clearly than the other, and the signal heard most distinctly indicates a close approximation to the exact direction from which the sound comes.

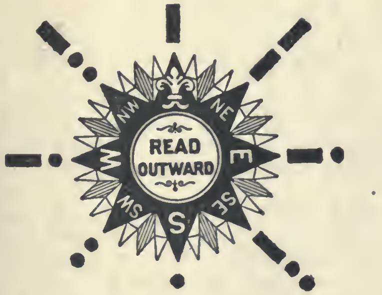


FIG. 4. SIGNAL CODE.
Dots denote short blasts, and dashes long blasts.

The sound-director consists of eight stationary megaphones, each being directed to one of the points of the compass, as shown in the illustration. It is also made of a single automatic revolving megaphone, which emits the appropriate sound on arriving at each point of the compass. Different points of the compass are indicated by a simple code of long and short blasts, the opposite points of the compass being in each case reversed; for example, north is one long blast, south is one short blast, west is a short blast and a long blast, and east is a long blast and a short blast. The signals for the different points of the compass are indicated on the accompanying diagram, Fig. 4.

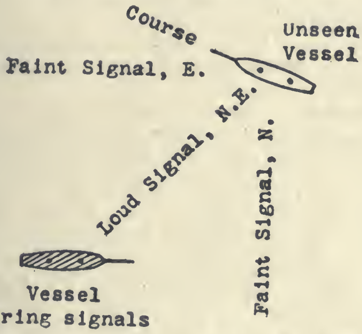


FIG. 5. RELATION OF SOUND BETWEEN TWO VESSELS.

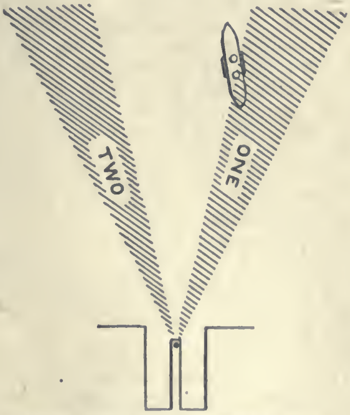


FIG. 6. FOG SIGNAL ON FERRY SLIP.

The diagram Fig. 5 shows the relation of the sounds as between two passing vessels.

When two signals are heard with equal clearness both louder than the following one, the direction of the danger must be midway between the points which are heard with equal distinctness. These signals may be placed on shore at lighthouse stations and ferry slips, etc., adding, in the latter case, the facility of a ship's attaining its proper slip, even in very foggy regions. The method adopted for this purpose is indicated in Fig. 6. These signals may also be applied to aid in manœuvring a fleet, enabling vessels to retain their relative positions and to maintain their distance.

FOHI, fō′hē′. See FUH-HI.

FÖHR, fẽr. One of the North Frisian Islands, situated in the North Sea, off the western coast of Schleswig (Map: Prussia, C 1). Area, about 31 square miles. The surface is partly elevated and partly marshy, the northern part being protected by a dike. The soil is productive. The population numbers about 4000, mostly Frisians speaking the North Frisian language. The chief occupations are fishing and seafaring. The island contains the town of Wyk.

FOI′BLE. Lady Wishfort's intriguing, untrustworthy maid, in Congreve's *Way of the World.* She is in Mirabel's pay.

FOIGARD, fwä′gär′, FATHER. A pretended French priest in Farquhar's *Beaux' Stratagem* (1705). He is an Irishman, and is found out by his accent.

FOIL (OF. *foil, fuel, fueill,* Fr. *feuille,* leaf, from Lat. *folium,* Gk. *φύλλον, phyllon,* leaf). A term used in architecture in combination with the numerals to indicate the number of *lobes* (q.v.) in mediæval openings or tracery, grouped so as to be tangent to a larger arc, either expressed or implied; there are *trefoil, quatrefoil, cinquefoil,* or *sexfoil* arches, according to the number of foils. The meeting-point of the foils is called the *cusp.* Moorish arches have the largest groups of foils; in very late Gothic they are also numerous. In late Romanesque and early Gothic the favorite group is the trefoil, with round foils in the former and pointed foils in the latter. See ARCH.

FOIL. A general name for thin metal intermediate in thickness between *leaf metal,* such as gold, silver, and copper leaf, and *sheet metal.* There are two distinct kinds of foil in common use: The very thin tinfoil used in chemistry, for electrical apparatus, and formerly for coating the backs of mirrors (q.v.); and the brighter, thicker foils, which, under the name of 'tinsel,' are made of copper, tin, tinned copper, or silvered copper, and are used by jewelers for theatrical and other ornaments. The foils used by jewelers for backing gems, sometimes called *Dutch foils,* consisting of small sheets of silvered copper rolled very thin, are colored with the following preparations, to suit the different gems under which they are to be placed, or for use as tinsel in the manufacture of theatrical ornaments, toys, etc.: Lake and Prussian blue, and pale drying-oil finely ground with a slab and mullar—

for amethyst color. Prussian blue similarly prepared—for sapphire color. Dragons' blood dissolved in pure alcohol—for garnet color. Ferrocyanide of iron and bichromate of potash, equal parts, very finely ground and sifted, then ground with a quantity of gum mastic equal to the other two ingredients, until the whole forms an impalpable powder; gradually form this into a thin paste with pure wood alcohol and preserve in a stoppered bottle; when used, a portion is diluted with wood alcohol to the necessary thinness—for emerald color. Various shades of yellowish or bluish green can be produced by varying the proportions of the two coloring materials. Lake or carmine ground in solution of isinglass—for ruby color. A weak solution of orange shellac, sometimes tinted with saffron, turmeric, or aloes—for topaz color. Several other color-varnishes are made by similar methods for various shades of tinsel and gem foils.

Gold foil is chiefly used by dentists for filling teeth, and differs from gold leaf only in being a little thicker. (See GOLD-BEATING.) Commercial *tinfoil* is largely adulterated with lead, and is used as a wrapping for tobacco, chocolates, and bonbons, toilet and other fancy articles. *Variegated foil* is made by laying thirty or forty thin plates of gold, silver, copper, and various alloys in a regular order, and then soldering the edges. A pattern of various depths is punched, and the metal hammered out into a thin sheet. The punch-marks disappear, and the pattern, appearing sometimes in one and sometimes in another of the metals, and much spread out, is very effective. It is suggestive of damaskeening on metal. See DAMASKEENING.

FOIL (probably from *foil*, to blunt, from OF. *fouler, foler, foller*, Fr. *fouler*, to trample, from ML. *fullare*, to full cloth by trampling, from Lat. *fullo*, fuller). A weapon used in fencing as a substitute for the short sword. See FENCING.

FOIX, fwä (Lat. *Fuxum*). The capital of the Department of Ariège, France, situated on the left bank of the river Ariège, 51 miles by rail from Toulouse (Map: France, H 9). It has a picturesque old castle, with three well-preserved towers of white marble, dating from the twelfth and fourteenth centuries, and an old church of the twelfth century. It has some trade in iron. Foix was the capital of the old countship of Foix. Population, in 1901, 7065.

FOIX. An old French family, which took the title of count from the District of Foix. The first who bore the title was BERNARD, in the early years of the eleventh century. RAYMOND ROGER, Comte de Foix, figures as one of the knights who accompanied Philip Augustus to Palestine; he died in 1223.—GASTON III., Comte de Foix, called Phœbus, married Agnes, daughter of Philip III., King of Navarre. He was a skillful warrior and fond of the chase. He wrote a work on the latter subject, which was greatly admired in the fifteenth century. Froissart (q.v.) owed some of the choicest incidents in his chronicles to having lived for some time in the castle of Orthes, Gaston's principal residence. After his death in 1391, the estates and title went to a collateral branch of the family, as in a fit of anger he had killed his only legitimate son.—GASTON IV., Comte de Foix, rendered good service to the King in the wars against England. He died in 1472.—Gaston's grandson, GASTON DE FOIX, Duke of Nemours, was the son of Gaston de Foix, Comte d'Estambes, and of Marie d'Orléans, sister of Louis XII. of France, and was born in 1489. In the Italian wars carried on by Louis, Gaston displayed the most brilliant and precocious genius. He was everywhere successful by the rapidity of his movements, which obtained for him the title of the *Thunderbolt of Italy*. He won the great battle of Ravenna over the Spaniards, April 11, 1512, in which, however, he fell, at the early age of twenty-three. Consult Castillon, *Histoire du comte de Foix* (Toulouse, 1852).

FOIX, PAUL DE (1528-84). A French ecclesiastic and diplomat. He studied in Paris and Toulouse, and lectured on civil law. At the age of nineteen he became a councilor of the Parlement of Paris. Through the favor of Catharine de' Medici, he rose rapidly to power. As Ambassador to England he endeavored to bring about the marriage of Elizabeth to the Duke of Anjou. Later he was Minister at Venice, Florence, and Rome, and Plenipotentiary at the Court of Henry of Navarre. He was reappointed to Rome in 1579, and died there five years later.

FO'KER, HARRY. A character in Thackeray's *Pendennis*. He is given to showy dress and sporting habits, and falls in love with Blanche Amory.

FOKIEN, fō'kē-ĕn'. See FU-KIEN.

FOKSHANI, fôk-shä'nê (Rum. *Focsani*). A town of Rumania in Moldavia, situated on the Milkov, a branch of the Sereth, 47 miles west-northwest of Galatz (Map: Balkan Peninsula, F 2). The vineyards in its neighborhood produce one of the best kinds of Moldavian wines, and the town carries on a considerable trade in grain with Galatz. In 1789 Fokshani was destroyed by the Russians. It was burned by the Turks in 1822. Population, in 1899, 23,783, including about 6000 Jews.

FOL, fōl, HERMANN (1845-92). A Swiss zoölogist. He was born in 1845, of German parents, and lost his life at sea in 1892. He took a medical degree in Berlin in 1869, but devoted himself to zoölogical studies. He was especially interested in the investigation of marine animals, and, being a man of wealth, was able to indulge his tastes by establishing a marine laboratory at Nice and visiting in his yacht the waters of various countries. His home was in Geneva, where for nine years he was professor of zoölogy. The following are among his more important works: *Die erste Entwicklung des Geryonideies* (1875); *Etudes sur le développement des mollusques* (1877); *Sur le commencement de l'hénogonie chez divers animaux* (1879); *Lehrbuch der vergleichenden mikroskopischen Anatomie* (1884); *Recherches sur la fécondation et le commencement de l'hénogonie* (1891); *Le quadrille de centres* (1891).

FOLARD, fô'lär', JEAN CHARLES, Chevalier de (1669-1752). A French soldier and writer on military affairs, born at Avignon. He entered the French Army, and fought in several campaigns in the wars of Louis XIV. Later he enlisted in the service of Charles XII. of Sweden, and particularly distinguished himself at the siege of Frederikshald in 1718. His works include: *Nouvelles découvertes sur la guerre*

(1724) and *Commentaire sur Polybe* (6 vols., 1727-30), a work once much read and widely discussed, of which Frederick the Great prepared a résumé to be found in "Esprit du chevalier de Folard," in *Œuvres de Frédéric le Grand* (1846-57), edited by Preuss.

FOLCLAND, fōlk′lȧnd (AS., folk-land), or **FOLKLAND**, fōk′lȧnd. The land of the folk, or the people of England in Anglo-Saxon times; the public domain. All land private title to which was not attested by charter was folkland or public land. It comprised the whole area of England that had not been assigned to individuals or communities at the first allotment, and that was not subsequently divided into estates of bookland. It constituted in England a permanent source of revenue, for it could not be alienated without the consent of the National Council, differing in this respect from the public lands of other Germanic tribes; thus the Lombards had public or State lands, but the pleasure of the King determined their disposal, while in England the King himself could not appropriate a part of the folkland without the consent of the Council. The English folkland had only an analogy, and not a similarity, to the common lands of the township in the mark system of the Teutonic races. The land could be let, lent, or leased; but this alienation extended only to the right possessed by the holder. The ownership continued to reside in the State, and the individuals who held portions, for which they paid rent and service, held only for life. The holders of folkland were liable to special burdens, payable directly to the State, and royal officers administered the jurisdiction. Such were the characteristics of the folkland down to the time of King Alfred. From his time the records contain less and less frequently the clause expressing the consent of the National Council to the alienation of the folkland. Gradually tnat body became only witnesses of the transaction, which finally received their mere attestation. In time the folkland became hardly distinguishable from the royal demesne. Consult: Stubss, *Constitutional History of England* (Oxford, 1874-78); Taylor, *The Origin and Growth of the English Constitution* (New York, 1898); Turner, *History of the Anglo-Saxons* (London, 1836).

FOLCMOT, fōlk′môt (AS. *folcgemōt*, from *folc*, folk + *gemōt*, meeting, from *mētan*, OS. *mōtjan*, Dutch *moeten*, to meet), or FOLKMOOT. In early Anglo-Saxon England, the national assembly or council. It was the assembly of the shire, comprising the representatives of the hundreds and townships. The folcmot, however, was not the Witenagemot (q.v.), for it is quite probable that in Kent, Sussex, Essex, and East Anglia, there were two central councils—the folcmot or council of the people, and the Witenagemot, or council of the chiefs. According to other authorities, the folcmot was the great meeting of the nation, which was afterwards converted into the Witenagemot, or meeting of the councilors of the nation.

FÖLDVÁR, fēld′vär. See DUNA-FÖLDVÁR.

FOLENGO, fô-lĕṉ′gô, TEOFILO. See MERLINO COCCAJO.

FO′LEY, JOHN HENRY (1818-74). An Irish sculptor. He was born in Dublin, May 24, 1818, and studied at the Dublin Society of Art, and afterwards at the Royal Academy, London. He first exhibited, in 1839, the "Death of Abel" and "Innocence," and made a decided reputation by his "Ino and Bacchus," in 1840. The works of his earlier period are chiefly of an ideal character, and possess rare grace and freshness of conception. Among the best of them are the "Youth at the Stream" (1844), the "Mother" (1851), the "Elder Brother in Comus" (1860). "Egeria" (1856) and "Caractacus" are both in the Mansion House, London. He excelled, however, in his portrait statues, which are noted for their strength of characterization. Among them are those of Hampden (1844), Selden, and Sir Charles Barry, in the Houses of Parliament; the colossal bronze equestrian statue of Lord Hardinge, and those of Lord Canning and Sir James Outram, produced for Calcutta; Lord Clive, produced for Shrewsbury; Oliver Goldsmith and Edmund Burke, for Dublin; Father Mathew, for Cork; the group "Asia" and the "Prince Consort," for the Albert Memorial in Hyde Park. The best of these works are perhaps the three Indian notables at Calcutta, especially Outram. During the War of the Rebellion Foley designed the seal of the Confederate States of America. His last work was a bronze statue of Stonewall Jackson, made for the State of South Carolina. He died at Hampstead, August 27, 1874. He was made an associate of the Royal Academy in 1849, and a member in 1858.

FOLEY, Sir THOMAS (1757-1833). An English admiral. He entered the navy at the age of thirteen, and served on the *Otter* in Newfoundland. In 1774 he went to Jamaica, and saw a good deal of service there against privateers; in 1778 he was made lieutenant and sent to America, under Lord Longford, and a year later took part in the Spanish campaign which terminated in the relief of Gibraltar. After service in America again, in the West Indies, and off Toulon (1793-95), he took part in the battle of the Nile (1798), and was with Nelson in the Baltic in 1801. His commander offered him the post of captain of the fleet off Cadiz, but Foley was not well enough to go. In 1808 he became rear-admiral; in 1812 was vice-admiral; admiral in 1820, and in 1830 commander-in-chief at Portsmouth, where he died three years later. Consult Herbert, *Life and Services of Admiral Sir Thomas Foley* (Cardiff, 1884).

FOLGER, fōl′jẽr, CHARLES JAMES (1818-84). An American jurist and politician. He was born in Nantucket, Mass., graduated at Hobart College in 1836, and after 1840 practiced law at Geneva, N. Y., where he was elected county judge, as a Republican, in 1857. He was State Senator from 1861 to 1867, during which time he served as chairman of the Judiciary Committee, and for four years was president *pro tempore*. He became associate justice of the New York Court of Appeals in 1870, and ten years later succeeded Judge Church as Chief Justice. He was Secretary of the Treasury in President Arthur's Cabinet from 1881 until his death. As the Republican nominee for Governor of New York in 1882, at a time when the party was seriously divided, he was defeated by Grover Cleveland by an overwhelming majority.

FOLGER, PETER (c.1618-90). An American colonist and clergyman. He was born probably at Norwich, England, and in 1635 settled in Watertown, Mass., whence he seems to have removed to Martha's Vineyard in 1641, where he was occupied as a school-teacher, a land surveyor, and an assistant to Thomas Mayhew in missionary work among the Indians. About 1663 he removed to Nantucket, where he acted as surveyor and interpreter, and for a short time as clerk of the courts. His daughter Abia was the mother of Benjamin Franklin. Folger was the author of a crude but vigorous work in verse, *A Looking-Glass for the Times; or, The Former Spirit of New England Revived in this Generation* (1676), in which, addressing himself to the Governors of the Colonies at the time, he advocates liberty of conscience and toleration of the Anabaptists, Quakers, and sects which had hitherto suffered persecution, and asserts that King Philip's War and other calamities are to be regarded as judgments of God for the absence of such toleration in the past. A reprint may be found in Stedman and Hutchinson, *Library of American Literature*, vol. i. (New York, 1887).

FOLGORE DI SAN GEMINIANO, fôl′gô-rȧ dȧ sän jä′mȧ-nyä′nô. An Italian poet, who flourished about the close of the thirteenth century. Of his life little is known. He was a contemporary of Dante and a writer of sonnets, some of which have been translated into English by D. G. Rossetti and J. A. Symonds. He wrote a series of political sonnets, which are of interest from their allusions to Italian life and society of the day, and another series celebrating the pleasures of the months and the days of the week. These latter are remarkable for their curious imagery and gentle satire. Consult: Rossetti, *Dante and His Circle* (London, 1874); and Navone, *Le rime di Folgore* (Bologna, 1880).

FOLIATION (from ML. *foliare*, to put forth leaves, from Lat. *folium*, Gk. *φύλλον*, *phyllon*, leaf). In geology, a term used to designate a parallel arrangement of mineral constituents in rocks, as in gneisses and schists. By some geologists it is distinguished from cleavage, schistosity, or slatiness, but this distinction is not based on essential differences. See CLEAVAGE.

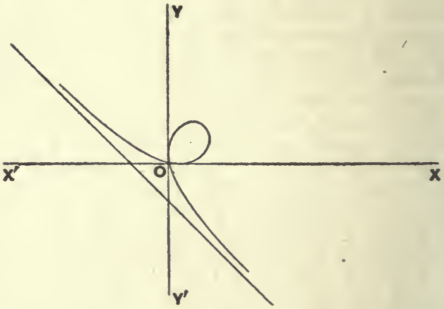
FOLIES-BERGÈRE, fô′lē′ bâr′zhâr′. A well-known amusement hall on the Rue Richer, Paris. It was founded in 1869 as a variety theatre, and offers musical and acrobatic performances, dances, and similar entertainment. It is provided with large corridors, serving as a promenade and a café. The name has been adopted by many other theatres in France.

FOLIGNO, fô-lē′nyô (Lat. *Fulginium*, *Fulginia*). A city in the Province of Perugia, central Italy, 760 feet above the sea, 80 miles southwest of Ancona (Map: Italy, G 5). In the Pinacoteca are Roman reliefs and paintings by Umbrian masters; in the Church of Santa Maria infra Portas, which has an eighth-century portico, are numerous frescoes of the fifteenth century by Niccolò da Foligno, who was born here and was the head of the Foligno school of painting; in the Church of San Niccolò are an altarpiece and a "Coronation of the Virgin" by the same artist. The cathedral has a thirteenth-century portal, fifteenth-century frescoes, and a few ninth-century columns. In Bevagna, five miles to the west, are two twelfth-century churches, one of which has been restored as a national monument, and in the churches of the neighboring Montefalco are many of the best paintings of the Umbrian school. In Trevi, the ancient Trebia, five miles south of Foligno, there are also important paintings, while from Le Vene, still farther to the south, can be seen the so-called Temple of Clitumnus (such a temple having been mentioned by Pliny), now known to be a sixth-century church built from the materials of ancient tombs. Foligno has a large theatre, a gymnasium, a technical school, a seminary, and a chamber of commerce. It markets silk, and manufactures machinery, leather, paper, and soap. The city was destroyed by the Perugians in 1281. It was ruled by the Trinci from 1305-1439, when it was annexed to the States of the Church. Population of commune, in 1881, 23,000; in 1901, 26,111.

FO′LIO (Lat., abl. sing. of *folium*, leaf). A book formed of sheets so folded as to make two leaves. See BOOK.

FOLIO, TOM. A personage appearing in number 158 of *The Tatler*. In drawing it Addison is said to have had in mind the bibliomaniac Thomas Rawlinson.

FOLIUM (Lat., leaf). A curve first studied by Descartes. Its equation in rectangular coördinates is $x^3 + y^3 - 3axy = 0$; hence the curve is of the third order. (See CURVES.) The origin is a double point, and the axes of coördinates are the tangents at this point, as they appear in the figure.



The line $x + y + a = 0$ is an asymptote (q.v.), and its infinite point of contact is a real point of inflection.

FOLKES, fōks, MARTIN (1690-1754). An English antiquary and scientist, born in London, and educated at Cambridge. In 1722 he was appointed vice-president of the Royal Society, over which he frequently presided when Sir Isaac Newton was absent, and of which he was chosen president in 1741. He was also president of the Antiquarian Society from 1749 until his death. He was a friend of Sir Isaac Newton, and was distinguished for his extensive information and upright character. The works entitled *A Table of English Gold Coins from the Eighteenth Year of King Edward III.* (1736) and *A Table of English Silver Coins from the Norman Conquest to the Present Time* (1745) were published by him at his own expense, and reprinted by the Society of Antiquaries in 1763. They were furnished with more than forty engravings, and were much consulted by antiquaries. He also contributed valuable papers on Roman antiquities to the *Transactions* of the Royal and Antiquarian societies.

FOLKESTONE, fōk′stôn. A seaport and municipal borough in Kent, England, on the Strait of Dover, seven miles west-southwest of

Dover (Map: England, H 5). It is an ancient town, with Roman, Saxon, and Norman remains, and is built on uneven ground at the foot of a range of hills, the oldest part lying in a narrow valley crossed by a fine railway viaduct. Its extension and improvement date from the opening of the South-Eastern Railway, the establishment of a daily steamer service with Boulogne, and the enlargement of the harbor. It has important fishing interests and a considerable shipping trade, the average total value of its imports and exports for the five years ending in 1900 exceeding £16,000,000, or $80,000,000, annually. Folkestone has a promenade pier, amusement pavilion and pleasure gardens, museum, and free library, and is a favorite sea-bathing resort. The parish church, renovated and restored, was the Priory Church of Saint Eanswith, built in 1095. A monument to Sir William Harvey (q.v.), discoverer of the circulation of the blood, born here in 1578, was erected in 1881. Population, in 1891, 24,000; in 1901, 30,694.

FOLKLORE. The learning of the uncultured; a branch of study that relates to traditional beliefs, old-time customs, usages, or observances preserved generally among the common people, and collects legends, myths, tales, folk-songs and superstitions for the purpose of record and comparison. Oral tradition and unwritten practice are important elements in matters of folklore, and a certain amount of obsoleteness or obsolescence is characteristic of the subjects that come under consideration, for the learning of to-day becomes the lore of to-morrow, so that a full knowledge of the folklore of every nation of the world would be synonymous with the history of human thought. The word 'folklore' as a designation is comparatively modern; it was first suggested by W. J. Thoms, in an article in *The Athenæum*, August 22, 1846, as a connotation for what is often called popular antiquities.

With regard to its antiquity, folklore studies date back as far as antiquarians themselves. The ancient Hindus, in their *Itihāsa* legends of the Vedas, and the Sanskrit myths and sagas of the *Purānas* (q.v.), recognized the fact, if not the form, of the study; and Herodotus and Livy were not blind to certain historic and traditional features in stories and observances among the common people which we to-day would chronicle as elements of folklore. But as a serious branch of investigation the study is comparatively recent. Yet we can recognize it distinctly, in spirit at least, as early as the opening of the eighteenth century. One of the first books of the kind to which we may point in England is Aubrey's *Miscellanies*, published in 1696. This contained much folklore material, as the work had chapters on day-fatality, omens, dreams, corpse candles, second sight, and kindred subjects; but the author himself was much given to superstition, and he attached especial prominence to that phase of thought in the book. The first real work on the general subject of folklore was an octavo volume by the Rev. Henry Bourne, *Antiquitates Vulgares; or, The Antiquities of the Common People* (Newcastle, 1725). It consists largely of an account of popular customs connected with the feasts of the Church. Addison, the essayist, also gave some attention incidentally to subjects in the line of folklore; but a marked step in advance was made when Brand's *Popular Antiquities of Great Britain* was issued at Newcastle in 1777, and became a standard work that has often been republished and revised. In Germany, Herder and the brothers Grimm were pioneers in the way of folklore studies, and were followed by such men as Adelbert Kuhn, Mannhardt, W. Schwartz, and Weinhold; for scientific method was brought into the study by the school of German workers. Among the Latin races, the French point to the names of Ballard and Moncrif, Spain to Fernan Caballero and Machado y Alvarez, Italy to De Gubernatis and others, as interested in this theme; so that to-day every country in Europe, including Greece, has some laborers in this department, or supports a regular journal and series of publications connected with folklore topics. In America especially there has been increasing interest in researches into the popular and traditional knowledge of the folk, because of the exceptional opportunities for studying the more or less savage and crude mass of primitive ideas and notions existing among the Indian tribes or preserved by the negro population. So widespread throughout the world is the interest in folklore that there is hardly a civilized or uncivilized race that has not received direct or indirect attention from some worker in the field. Associations for the study of folklore, like the English Folklore Society, founded in 1878, the French society for the study of popular traditions, with its *Revue des traditions populaires* (Paris, 1886—), the American Folklore Society, founded in 1888, and many others. These have helped largely to lift folklore studies out of the mere antiquarian stage, and to make them a valuable auxiliary in anthropological and ethnological investigations.

As a branch of research, folklore is extremely comprehensive in its scope. Some idea of its breadth may be gathered from the following scheme of groups and subgroupings of topics arranged by the London Society of Folklore in its *Handbook*. The outline is as follows:

Ideas and Superstitious Beliefs

1. Superstitious belief and practice.
2. Superstitions connected with great natural objects.
3. Tree and plant superstitions.
4. Animal superstitions.
5. Goblindom.
6. Witchcraft.
7. Leechcraft.
8. Magic and divination.
9. Beliefs relating to future life.
10. Superstitions generally.

Traditional Customs

11. Festival customs.
12. Ceremonial customs.
13. Games.
14. Local customs.

Traditional Narratives

15. Nursery tales or Märchen; hero tales; drolls; fables and apologues.
16. Myths relating to creation, deluge, fire, and doom.
17. Ballads and folk-songs.
18. Place legends and traditions.

Folk-Sayings

19. Jingles, nursery rhymes, riddles, etc.
20. Proverbs.
21. Nicknames, place rhymes.

The themes of folklore may be: (1) Cosmic phenomena and origins; (2) the heavenly bodies in their appearances and disappearances, their movements and associations; (3) physical and meteorological phenomena; (4) geographic features; (5) the plant kingdom; (6) the animal kingdom; (7) human beings in every possible state and activity, whether individually or collectively as a community; (8) the spirit world in association with man.

Those among whom the lore is to be found may be a tribe, a race or people, inhabitants of a region, a social class, or people representing a calling in life. Any or all of these themes of lore existing in any human group may be investigated in accordance with the folklore society's scheme, which takes in serious and seemingly trivial topics alike. The folklorist by his researches may advance our general knowledge of folk-industries, folk-æsthetics, and folk-sociology. Scientific investigations of myths and their origin, or the tracing of the migrations of tales, have contributed information in respect to community of descent or with reference to interchange of ideas through geographical proximity or through emigration. These have their value to the ethnologist, or they show the anthropologist how similar conditions call forth similar phenomena, as in the matter of kindred nursery rhymes, or counting jingles, games, or customs, among totally unrelated peoples of the world.

A study which has yielded so much, and may yield such great results, deserves its recognition as a scientific branch of research, if pursued with proper equipment, thorough and correct method, and with judgment. In the earlier days the collectors naturally worked in the field as dilettanti, and there was a tendency to look upon the examples of myths, customs, superstitions, or belief, rather as curiosities than as telling some story of human civilization. There was too great an inclination to add to the attractiveness of the picture that was drawn by touching it up or giving it special color; there was a natural proneness to modernize the legend that was recorded, to introduce material, or make more up-to-date folk-songs than were set down. One thing above all is now recognized as essential for the true folklorist; it is fidelity and scrupulous care in recording the matter, whatever it be, if he expects it to have any real scientific value. Special caution, moreover, and heed in drawing deductions is indispensable. For example, in accounting for folk thought and custom, especially the occurrence of the same phenomena in regions wide apart, among peoples of different race, or belonging to distinctly different types, the following cautions should be observed:

(1) To be sure that the resemblance is actual, and not superficial.

(2) To keep in mind that sporadic resemblances may be purely accidental.

(3) To remember that all mankind under similar environments has thoughts and ways in common, on the axiom that like causes produce like effects.

(4) To recognize the fact that the more numerous the instances and the more complex the customs under consideration, the more centainly has there been acculturation of some kind, but caution must be observed in drawing deductions of blood relationship from similarities in sayings and arts.

Bibliography. The number of works, articles, or treatises on the various branches of folklore study is immense. For convenience simply, reference may be made to Gomme, *Handbook of Folklore* (London, 1887); id., *Ethnology in Folklore* (New York, 1892); Cox, *An Introduction to Folklore* (London, 1895). The best bibliographic lists may be obtained from consulting the special journals devoted to the subject, such as the *Journal of American Folklore*, published by the American Folklore Society (Boston and New York, 1888 et seq.); *Folklore*, being the transactions of the Folklore Society (London, 1890 et seq.); *Beiträge zur Volks- und Völkerkunde* (Berlin, 1893 et seq.); *Mélusine* (Paris, 1877 et seq.); *Bibliotheca de las traditiones españolas* (Madrid, 1881 et seq.); *Archivio per lo studio delle tradizione popolari* (Palermo, 1881 et seq.); *Bulletin du Folklore* (Brussels, 1891 et seq.); *Sweizererisches Archiv für Volkskunde* (Neuchâtel, 1897 et seq.). See also Demonology; Folk-Music; Ghosts; Man; Marriage; Mortuary Customs; Sophiology.

FOLK-MUSIC. Music which is the outgrowth of a people's development, as opposed to *national music*, which owes its existence to the characteristic compositions of a few individuals. National music, however, may be, and generally is, based on the folk-music of the country. Folk-tunes are the wild flowers in the realm of music. They are valued to-day more highly than ever, both for their intrinsic beauty and as themes for composers with nationalistic tendencies. By way of supplementing the earlier collections of songs and dances made by private individuals, the governments of several European countries have in recent times borne the expense of gathering and printing whatever could be found of this indigenous folk-music, while the inventive faculty of composers has been frequently rejuvenated, during the last eight centuries, at this inexhaustible fount of original melody. This is particularly noticeable in the case of Hungarian folk-music, which has provided material not only for native composers, but also for Germans, especially those who made their home in Vienna. Haydn made good use of folk-music, and in more recent times Liszt collected a great number of the Magyar melodies as played by the Gypsies, and used them as the themes for his Hungarian rhapsodies. Even Schubert, the most spontaneous of all melodists, was so struck by the charm of the Magyar melodies that he copied some of them and embodied them in his works. Brahms and others did the same thing. In Russia, Poland, Bohemia, and Scandinavia, Tchaikovsky, Chopin, Dvořák, Grieg, and many others adopted the melody of the people, or fashioned their own in its image. Beethoven went to Scotland and Ireland for the melodies of some of his songs, and to Russia for the themes of some of his chamber compositions. Nor have Oriental countries been ignored. Puccini traveled as far as Japan in one of his operas. Edgar Kelley wrote a Chinese suite, and Edward MacDowell an Indian suite based on aboriginal American melodies.

The lower the composer descends in the scale of civilization, the more refractory his borrowed material is apt to prove. While primitive music—the music of uncivilized peoples—also comes under the head of folk-music, in the widest sense of the word, it is too different in character and too wide in scope to be treated of under this head. One misconception regarding it may, however, be corrected here. It is not true, as commonly assumed, that the vocal music of the lower races is always associated with words. The songs of savages are frequently songs without words, or with words that have no meaning. But when we come to mediæval European folk-song, we find that what Wagner wrote concerning it is true: "The word-poem and the tone-poem are one and the same thing. The people never think of singing their songs without words. . . . The two seem to belong together, like husband and wife." Owing to this close adaptation of the music to the words, the mediæval folk-music is indeed more artistic than the art-music of the ecclesiastical composers of the same period, who usually maltreated their words, or buried them under a rank growth of contrapuntal artifices. Nor is this the only point of superiority. While the ecclesiastical composers were still hampered by the unwieldy Church modes, folk-music had instinctively adopted the modern major and minor modes, and thus represented, in its day, the music of the future. Furthermore, it had much greater rhythmic variety, as well as more melodic originality and charm, so that it is not surprising that the Church composers began, as early as the twelfth century, to adopt folk-tunes as themes for their masses and motets. Too often they distorted them almost past recognition; but in the sixteenth century Luther had the courage to discard the monotonous Gregorian chants and substitute for them in church good folk-songs, unaltered except as to the words. It is not difficult to understand why folk-songs should have been, as a rule, more spontaneous than the art-music of these early times. The Church composers were hampered by artificial rules, and there were only a limited number of them, whereas the folk-singers were countless in number and could do as they pleased. The assertion made in musical histories that the folk-songs of Europe were invented by the Troubadours (q.v.) and Minnesingers (q.v.), and from them passed to the people, is contrary to the facts. It was the Troubadours and Minnesingers who got many of their tunes from the people; and among the people they were a matter of slow growth. Few, perhaps, were the product of one mind. A man might spontaneously conceive a melody to give expression to his feelings of love or religious fervor, or some other joyous or sad emotion; others would repeat it, with additions and improvements, until finally a perfect melody would be evolved—a melody that spoke to the hearts of all. Usually folk-songs were sung as melodies only; in some cases harmonic parts were added, but the best of these melodies are so rich that they seem to require no harmonies.

Of all European countries, Germany probably has the greatest number and variety of good folk-songs. Many collections of them have been printed, a list of which may be found in Engel's *The Literature of National Music* (London, 1879), a valuable guide for the student of this subject. As folk-music is anonymous, and not copyrighted, and as it frequently undergoes slight changes, it is not surprising that few of the old German tunes have come down to us unaltered. They were affected by contact with art-music, which gradually wore off their rough edges and polished them; and since Germany has set the standard in modern music, it is easy to understand why its folk-songs should, for these reasons, seem normal to us—that is, deficient in those exotic traits which characterize the popular music of such countries as Russia, Scandinavia, and Hungary. Italy and France are in this matter in the same position as is Germany, because they, too, have helped to fix the modern musical standard. That does not make their folk-songs any less admirable, but it prevents them from exercising so striking an influence on the art-music of our time. Italy, the 'land of song,' has, strange to say, contributed little of great value to the world's stock of authentic folk-music. There were, of course, in the olden times, plenty of *ballate, villanelle, frottole*, and other kinds of folk-music; nor is there a lack of collections of what purport to be Italian folk-songs, Neapolitan, Sicilian, Venetian, and so on; but in most cases it is impossible to tell whether these melodies were really invented by the people in true folk-music fashion, or whether they were taken from the thousands of operatic scores which have practically monopolized the musical interest of the Italians ever since the beginning of the seventeenth century. The best songs in Petrucci's collection, published in 1503, are taken from German, French, and other sources, and there is reason for the assertion made by Mrs. Wodehouse that "Italian musicians held the popular songs of other countries in higher estimation than their own." So far as Italian songs have harmonic accompaniments, they are apt to be simple and commonplace, avoiding modulation; and the songs are more interesting melodically than rhythmically.

In French folk-music also no great attention is paid to harmony or accompaniment, but rhythmic variety and piquancy constitute a striking trait, and the words are apt to govern the tune, instead of vice versa, as in Italy. Among the French *airs, chansons, chants*, and *romances* there is plentiful variety of subject; many are witty, and political songs are popular. There are also *brunettes*, addressed to young girls, and other tender songs; but French folk-music seldom is so soulful and romantic in its yearnings as the German, or so poignant in the expression of grief as the Russian or Scandinavian. In the neighboring country of Spain folk-music has much more of an exotic character than in France, Italy, or Germany; nor is this surprising, since in that country, especially in Andalusia, the Moorish influence makes itself strongly felt. This is shown in the predominant use of song as an accompaniment to dancing; in quaintly Oriental melodic intervals; in the abundance of ornaments; and in the simultaneous use of several rhythms. But whether Oriental or purely Spanish, there is an ineffable charm in the national music of the Spanish people—the *jotas, boleros, fandangos, seguidillas, malagueñas*, etc. Bizet caught some of the charm of this music in his *Carmen;* and some day, if Spain ever gives birth to a Liszt, a Dvořák, or a Grieg, marvels of novel musical beauty may be expected.

While England has long been reputed an unmusical country—chiefly for the reason that, like Spain, it has never produced a composer of the first rank—there was a time when the people of that country were as musical as those of any other part of Europe, so far, at least, as the enjoyment and practice of music are concerned. There were always bards and minstrels, who were richly rewarded for their services, and in the dim past every man was apparently expected to be able to sing and accompany himself on the harp. What is most surprising about English music, both popular and professional, is that there is so little about it that is characteristically national. This is particularly true regarding instrumental music (of which all Continental nations have such abundant variety) and folk-song. It is only in concerted vocal music, the madrigal, and the glee, that we find a national flavor. The ballad is, indeed, also very much favored in England; the *Beggar's Opera,* with its sixty-nine popular ballads and dance tunes, struck the keynote of English taste; yet, in most instances, the words of the English ballads have infinitely more merit and national character than the music. In Wales, Ireland, and Scotland, on the other hand, the popular music not only has a strong national flavor, but it is almost as exotic as that of the border lands of the European Continent. The charms of Irish folk-melodies have been made known to thousands by the association of a number of them with Moore's poems, and in more recent times through the collection made by Villiers Stanford, who also wrote an opera, *Shamus O'Brien,* full of quaint musical Hibernicisms.

Of Scotland's folk-music there are almost as many collections as of Germany's, and they include many gems of the first water. The bagpipe is typical of Scotch folk-music; it is not, as many suppose, an instrument on a level with the barrel organ, but has a great fascination for educated musicians, with its persistent drone and queer melodic intervals. Scotch music has a characteristic which it shares with the Chinese—the pentatonic (or five-tone) scale which omits the fourth and seventh tones of the ordinary diatonic scale; it can be amusingly imitated by playing only on the black keys of a piano. Scotch music also has a good deal in common with the folk-music of Scandinavia, especially Norway. The Norwegian, Grieg, was partly of Scotch descent, and so is his music. Grieg did not, as so many writers have erroneously stated, habitually incorporate Norwegian folk-melodies in his compositions. What he did was to write in the style and spirit of Norwegian folk-music. This music shares the rugged, gloomy characteristics of Norwegian scenery and climate; it indulges in frequent capricious changes of rhythm and tempo, occasioned by the close alliance between the words and music; it evinces a preference for the minor mode; its tonality is often uncertain; and its melodic intervals are strange to our ears.

Similar traits are noted in the national melodies of Russia, which, according to Rubinstein, are equaled in charm only by those of Sweden and Norway, while César Cui claims for Russia supremacy over all countries. The typical Russian folk-song is of limited compass, and this is probably attributable to the primitive instruments of the lute and violin families long in use. The prevailing mood of these songs is melancholy, but some of them are characterized by a wanton excess of animal spirits. Florid passages on one syllable occur, and the harmonies are apt to be bold and harsh. Liszt's ultra-modern discords had no terrors for the Russian composers brought up on such food. Bohemian music is remarkable for its varied rhythms and great diversity of dances. Polish folk-music is chiefly instrumental; its general traits are well known, owing to the wide diffusion of the works of Chopin, in which (especially the mazurkas) they are admirably reflected. The *tempo rubato,* or capricious and frequent change of time, is also an essential trait of Hungarian music, although its use in the mazurka differs widely from its application to the Gypsy csárdás (q.v.). Hungarian music has a scale of its own, with an augmented fourth that intensifies its melancholy. It is usually highly ornamented, and these ornaments were supplied by the Gypsies, while the melodies themselves are of Magyar origin. All these things go back to a remote antiquity. Folk-music is never the growth of a few centuries; it requires ages and isolation, and this is why the New World, cosmopolitan America, has none.

BIBLIOGRAPHY. The best series of articles on folk-music are those by Krehbiel which appeared in the New York *Sunday Tribune* for July, August, September, and October, 1899. Consult also: Finck, *Songs and Song Writers* (New York, 1900); Parry, *The Evolution of the Art of Music* (New York, 1896); Wallaschek, *Primitive Music* (New York, 1893); Engel, *An Introduction to the Study of National Music* (London, 1886); and Leland and Prince, *Popular Songs of the Algonquins* (New York, 1902).

FOLK-PSYCHOLOGY. A branch of anthropology devoted to studying the psychology of races and peoples. It must not be confounded with folk-lore, which studies survivals; but it is akin to ethnology. It is the application of the processes and methods of the modern physiological psychologists to races, peoples, social classes, sexes, professions, sects, as such, aided by the most refined apparatus, with a view of tracing activities in common, ceremonies, and institutions to their origin. Besides the data acquired by these means, it avails itself also of facts gathered through somatic anthropology, ethnology in all its branches, archæology, and folk-lore.

Psychologists, among them Wundt and Baldwin, and moralists, as, for example, Felix Adler, hold that the mental development of the individual is best fostered by a knowledge of the mind of the race. Skull form, brain weight, and brain form are not alone sufficient to determine the action of the individual nor the attitude of society toward him. As a rule, the insane and the geniuses have large brains, while idiots have small brains. But men of ordinary intelligence have had as large brains as geniuses, while it has been discovered that the brains of men of great ability have been in many cases but little larger than those of idiots. So while it is approximately true that power is in proportion to muscular mass, it is not necessarily true that brain power is in proportion to nerve mass. A different principle of metabolism applies to the nerves from that which holds with respect to muscles. As to the significance of brain form, the results of Lombroso's measurements of criminals are the best evidence. The cranial measurements of normal people taken by Baer reveal exactly the same characteristics as prevailed among the criminals measured by Lombroso. The fact is that cosmic and terrestrial environment, as a whole and in minute details, has coöperated in the creation and development of civilization. Especially in the lower races, who have not learned to artificialize their surroundings, the skin and the stomach are joined with the brain in bringing about, guiding, gauging, and giving tone and tint to all mental processes.

Folk-psychology considers the habitat and food conditions of a people, its somatology, sex, technology, æsthetics, jurisprudence, and pathology. Nearly all the life processes are reducible to the stimuli for food and sex. Necessity determined association and made man social. In extremes of heat and cold life is possible at a great disadvantage. Of necessity, the highest civilizations began in warm climates, and with the artificial means of controlling temperature, they advanced to colder climates. The natural races are in bondage to nature, but where the environment is favorable they make themselves less dependent upon it, and so develop culture. Where large populations can be supported, coöperate life is necessary, and consequently people are more social than where population is sparse. In the struggle to secure food cunning is developed. Where the conditions are difficult, habits of industry are developed, and when a better control over environment is secured the energy set free is expended in the satisfaction of higher wants. Production is thus a fundamental process. Southern races are more hospitable than northern races because the food-supply is more abundant. Climate exercises a great influence on the thinking processes, and in this way affects civilization favorably or unfavorably. This influence is again seen in the greater number of cases of insanity in May and July, when the climatic changes are most sudden.

Marriage, the outgrowth of the sexual instinct, is the more or less permanent relation of the male and female. As it is determined by the necessity for the coöperation of the parents in the care of the offspring, marriage is grounded in the family, and not the family in marriage. The family has been a growth from very feeble and uncertain beginnings. The forms of marriage at different periods of race development have been shaped almost entirely by economic conditions. Man represented the militant and woman the industrial type of organization. Man's work was destructive, while woman's preserved the food-supply. Man's work made him radical, while woman's work made her conservative. Man's work fitted him for great bursts of endurance, while woman's work made her capable of steady endurance. From origins such as these, and from their course of development, the folk-psychologist endeavors to explain race and individual psychology, and in this way to account for the factors which operate even in the complexity of modern civilization. Consult: Emin Effendi, *Kultur und Humanität* (Vienna, 1897); Wundt, *Völkerpsychologie und Sprachgeschichte* (Leipzig, 1900—); and especially the *Zeitschrift für Völkerpsychologie und Sprachgeschichte*, edited by Lazarus and Steinthal (Berlin, 1860-1890), and its continuation, the *Zeitschrift des Vereins fur Volkskunde*, edited by Weinhold (ib., 1891 et seq.).

FOLKRIGHT. The body of customs recognized as having the force of law in early English history. As used by the Norman kings, the expression has reference to the native law and custom, as distinguished from the rules and observances introduced by the Conqueror and his followers. Later, the term is synonymous with the expression common law, by which it was soon superseded. Consult the authorities referred to under ANGLO-SAXON LAW.

FOLKS, fōks, HOMER (1867—). An American sociologist, born in Hanover, Mich. He was educated at Albion College (Mich.) and at Harvard, where he graduated in 1890. From 1890 to 1893 he was secretary of the Children's Aid Society of Pennsylvania, and from 1893 to 1902 secretary of the New York State Charities Aid Association. He was elected to the New York City Board of Aldermen as an Anti-Tammany member in 1897 and 1898, and was an unsuccessful candidate for the State Assembly in 1899. In the spring of 1900 he went to Cuba to assist the United States military authorities in reorganizing the public charities of the island. In 1901 he became secretary of the National Conference of Charities and Correction, and in January, 1902, was appointed by Mayor Seth Low Commissioner of Charities for New York City. His literary work includes the editing of the *Charities Review*, and the publication of numerous reports and magazine articles, and a book entitled *The Care of Destitute, Neglected, and Delinquent Children* (1902).

FOL'LEN, AUGUST, afterward ADOLF LUDWIG (1794-1855). A German author. He was born in Giessen January 21, 1794. He was imprisoned (1819-21) for political agitation in Berlin, and after his release spent his life in Switzerland. He died in Bern December 26, 1855. He is best known for his anthology of German poetry, *Bildersaal deutscher Dichtung* (1827), but also for editions of the *Nibelungenlied* and Gottfried's *Tristan und Isolde*, for a collection of *Latin Hymns* (1819), and for translations of the *Homeric Hymns* (1814) and Tasso's *Jerusalem Delivered* (1819). His chivalrous romances, e.g. *Malegys und Vivian* (1829), and his poems, with few exceptions, are not important.

FOLLEN, CHARLES THEODORE CHRISTIAN (1795-1840). A German clergyman, scholar, and reformer, brother of the preceding. He was born at Romrod, in Hesse-Darmstadt, and studied theology at Giessen, where he showed himself an ardent believer in the principles of the French Revolution. After some weeks of soldiering against Napoleon in 1814, he returned to his studies, and in 1818 received an appointment as university lecturer in law. His revolutionary views, however, expressed in radical songs and inflammatory addresses, drove him from Giessen to Jena, and thence to France, to Coire in Switzerland, to Basel, where he was appointed lecturer at the university, and finally, in 1824, to America. In 1825 he was appointed a teacher of German at Harvard College, and, three years later, became teacher of ecclesiastical history and ethics in the divinity school. From 1830 to 1835 he was professor of German literature at Harvard. Later on he preached in the First Unitarian Church of New York City, and in 1839 accepted a call to the pastorate of a church of the same denomination in Lexington, Mass. From the commencement of the anti-slavery movement he was an avowed abolitionist, and a warm friend and associate of Garrison. He lost his life in the burning of the steamboat *Lexington* on Long Island Sound January 13, 1840. His works, with a *Mémoir*, were published at Boston in 1841.

FOLLEN, Eliza Lee (Cabot) (1787-1860). An American author, born in Boston, Mass. She was a friend of William Ellery Channing, and was a stanch abolitionist. Her writings were at one time very popular, and include, besides a *Memoir* of her husband, Prof. Charles Theodore Follen (1842), *Well-Spent Hours* (1827); *Poems on Occasional Topics* (1839); *To Mothers in the Free States* (1855); and *Anti-Slavery Hymns and Songs* (1855).

FOL'LETT, Sir William Webb (1798-1845). An English lawyer and politician, born at Topsham, near Exeter. After studying at Trinity College, Cambridge, and at the Inner Temple, he commenced practice as a pleader in 1821, and was called to the bar in 1824, where his success was immediate, and his progress rapid. In 1835 he was returned to Parliament for Exeter, and soon gained distinction. Under Sir Robert Peel he served as Solicitor-General. In 1835 he was knighted, and in 1844 succeeded Sir Frederick Pollock as Attorney-General, but his health having failed, he was forced soon afterwards to give up practice. As an advocate, Follett was lucid and persuasive, though never eloquent.

FOLLEVILLE, fôl'vêl', Gabriel Guillot de (1760-94). A French priest, who took a prominent part in the Revolution. He was born in Brittany, and studied law, but on the outbreak of the Revolution decided to enter the Church. He became curate of Dol in the spring of 1790; in 1791 he retracted his oath to the civil constitution, and was forced to flee to Paris by his disgusted parishioners. But after the Tenth of August he left Paris, went to Poitiers, and there began his remarkable career of deceit. Going to the Convent of the Filles de la Sagesse, he announced himself as a Papal delegate and Bishop of Agra, and became one of the leading Jacobins of the town. In 1793 the 'Bishop of Agra' was made the head of the ecclesiastic council of Saint Laurent sur Sèvre, then of the administrative and judicial councils of another department. Abbé Bernier, of Saint Laud, jealous of Folleville, made inquiries in Rome about him, and learned that there was no Bishop of Agra. After the defeat of Mans he was captured, taken to Angers, recognized, tried, and guillotined. Consult: Chassin, *La préparation de la guerre de Vendée* (1892); and Bossard, *L'invention de l'évêque d'Agra* (1893).

FOLLICLE (Lat. *folliculus*, diminutive of *follis*, bag; probably connected ultimately with OHG. *ballo*, Ger. *Ball*, Icel. *bollr*, Eng. *ball*). A dry fruit or pod, composed of a single carpel, and opening by splitting down one side, as that of the peony. See Fruit.

FOLL'IOTT, Dr. The leading character in Peacock's *Crotchet Castle*. He is disputatious and fond of classical quotations.

FOLLY ISLAND. An island off the coast of South Carolina, in Charleston Harbor, extending from Stone River on the south to Lighthouse Inlet on the north, and separated from the mainland by Folly Island Channel (Map: South Carolina, E 4). It was the scene of some important operations during the Civil War.

FOLLYWIT. The young spendthrift in Middleton's *A Mad World, My Masters.* The deceptions and practical jokes which he practices upon his grandfather, Sir Bounteous Progress, are the chief incidents of the play.

FOLQUET DE MARSEILLE, fôl'kâ' d*e* mär'sâ'y' (1155-1231). A Provençal poet and troubadour. He was born in Marseilles of wealthy parents, but chose the roving life of a minstrel, traveled from Court to castle, reciting his verses, making love to noble ladies, and composing in their honor poems which evidenced genuine feeling. When nearly forty years old he experienced a change of heart, entered the Church, and by 1203 was Bishop of Toulouse and a fanatical persecutor of heretics. Because of the asceticism of his later years, the looseness of his early life was so far overlooked that Dante awarded him a place in *Paradiso* (canto ix.). Thirty of his poems remain, but there is no modern edition of them.

FOL'SOM, Charles (1794-1872). An American scholar and editor, born at Exeter, N. H. He graduated in 1813 at Harvard, and in 1816 became a chaplain in the United States Navy, and midshipmen's instructor in mathematics on board the *Washington.* In the latter capacity he had David G. Farragut as one of his pupils. From 1821 to 1826 he was at Harvard, as a tutor in 1821-23, as librarian in 1823-26, and as instructor in Italian in 1825. He was subsequently a partner in the firm of Folsom, Wells & Thurston, printers, and superintended the publication of classical works for Harvard. In 1824 he was an editor of the *United States Literary Gazette*, with W. C. Bryant, and in 1833 of the *Select Journal of Foreign Periodical Literature* with Andrews Norton. His publications were annotated editions of *Cicero's Select Orations* (1811), and of *Additional Selections from Livy* (1829).

FOLSOM, Charles Follen (1842—). An American physician, born at Haverhill, Mass. He graduated at Harvard in 1862; from 1862 to 1865 was an instructor among the freedmen of the South; in 1870 graduated at the Harvard Medical school, and subsequently practiced medicine in Boston. In 1873-75 he studied at the universities of Vienna, Berlin, and Munich; from 1877 to 1885 was lecturer on hygiene at Harvard, and from 1879 to 1882 lecturer in and assistant professor of mental diseases. In 1882 he became a member of the National Board of Health, Lunacy, and Charity. His writings include: *Mental Diseases,* and *The Present Aspect of the Sewage Question as Applied to Boston* (1877).

FOLSOM, George (1802-69). An American antiquary, born at Kennebunk, Maine. He graduated in 1822 at Harvard, was subsequently admitted to the bar, and practiced law at Worcester, Mass. In 1837 he removed to New York City, in 1844 was elected to the New York State Senate, and from 1850 to 1854 was chargé d'affaires to Holland. He was a member of the New York Historical Society, and at one time president of the American Ethnological Society. He published *Sketches of Saco and Biddeford* (1830); *Dutch Annals of New York* (1841); *Letters and Dispatches of Cortez* (1843); and other works.

FOLSOM, Nathaniel (1726-90). An American Revolutionary soldier and legislator, born in Exeter, N. H. He commanded a company of New Hampshire militia in the French and Indian War, served under Sir William Johnson at Fort Edward, and participated in the defeat and capture of Baron Dieskau in 1755. At the outbreak of the Revolution he was commissioned a brigadier-general of New Hampshire volunteers, served at the siege of Boston, and was promoted a major-general by the Council of New Hamsphire, and served as such throughout the war. He was a delegate from New Hampshire to the Continental Congress in 1774, and again in 1777 and 1778. In 1783 he was president of the New Hampshire Constitutional Convention.

FOLTZ, fōlts, Philipp (1805-77). A German painter, born at Bingen. He was the pupil of his father, Ludwig Foltz, and studied at Munich under Cornelius. There he was employed to paint the frescoes in the Glyptothek, and afterwards the Schiller-Salon in the new Royal Palace. He finally became professor of the Academy of Munich and director of the Royal Galleries (1865). His pictures include two large hunting scenes for Maximilian II., and various historical paintings, such as "Frederick Barbarossa," "Henry the Lion," the "Century of Pericles," and "King Otho Leaving Munich for Greece" (1832)—a fine cartoon.

FOL′WELL, William Watts (1833—). An American educator, born at Romulus, Seneca County, N. Y. He graduated at Hobart College in 1857, and in 1859 was appointed adjunct professor of mathematics at Hobart. In 1860-61 he studied philology at the University of Berlin. When he returned to the United States he enlisted in the Fiftieth New York Volunteers (engineers), and attained the brevet rank of lieutenant-colonel. In 1869 he accepted the chair of mathematics at Kenyon College, Ohio, and in the same year was chosen president of the University of Minnesota, a position which he occupied until his resignation in 1884. In 1871 he was appointed professor of political economy, which position he retained after his resignation from the presidency. His publications include: *Public Instruction in Minnesota* (1875), and *Lectures on Political Economy.*

FOLZ, fōlts, Hans (c.1478-c.1515). One of the famous Meistersingers, and a writer of rhymes and dramatic pieces. He was born at Worms, Germany, and spent the greater part of his life in Nuremberg, where he worked as a barber. His serious songs are spirited, graceful, and moral in tone; but his comic writings are quite the reverse.

FOMENTATION (from Lat. *fomentatio*, from *fomentare*, to foment, from *fomentum*, fomentation, from *fovere*, to keep warm). An application of warmth and moisture to a part by means of cloths wrung out of hot water, sometimes medicated infusions of vegetable substances, calculated to relieve pain or stimulate the surface. Thus, opium, belladonna, chamomile, turpentine, etc., are used in various forms in connection with fomentations, which are of very great service in the treatment of several painful local disorders.

FONBLANQUE, fôn-blăŋk′, Albany (1793-1872). An English journalist. He was born in London in 1793, and first studied for the bar, but afterwards drifted into journalism. As editor of the *Examiner*, the leading Liberal weekly journal of the time, Fonblanque exhibited a singular keenness of both wit and intellect, and exercised great influence on public opinion between 1826 and 1836. In 1837 he republished in book form his leading articles, under the title *England Under Seven Administrations.* Fonblanque belongs to that small group of journalists whose work survives them. In 1847 he relinquished the editorship of the *Examiner*, and entered the statistical department of the Board of Trade. He died October 13, 1872. Consult Fonblanque (editor), *The Life and Labors of Albany Fonblanque* (London, 1874).

FONCIN, fôɴ′săɴ′, Pierre François Charles (1841—). A French geographer and educator, born at Limoges. He studied at the Ecole Normale of Paris, and in 1876 became professor of geography in the faculty of letters at Bordeaux. In 1879 he was appointed director of the Douai Academy, in 1881 director of secondary education in the Ministry of Public Instruction, and in 1882 inspector-general of secondary education. He was a founder of the Alliance Française, of which he became successively general secretary and president. His publications include: *Textes et récits d'histoire de France* (1872), for use in primary schools; *La prémière année de géographie* (1874); a *Géographie générale* (1887); and *Les pays de France* (1898).

FON′DA. A village and the county-seat of Montgomery County, N. Y., 27 miles west by north of Schenectady; on the Mohawk River, and on the New York Central and the Fonda, Johnstown, and Gloversville railroads (Map: New York, F 3). It is the centre of an agricultural region, and has knitting-mills, flouring-mills, a broom-factory, etc. Population, in 1890, 1190; in 1900, 1145.

FONDI, fôn′dē. The ancient Fundi, a town in South Italy, in the Province of Caserta, 7 miles from the sea and 87 miles southeast of Rome (Map: Italy, H 6). The ruins of the castle, which in the sixteenth century belonged to the Colonnas, testify to its former splendor. In the Gothic Church of Santa Maria there are some eleventh-century mosaics, and Thomas Aquinas once taught in the chapel of the Dominican monastery. Fondi was burned by the Saracens in 846, laid waste in 1534 by the pirate Khair-ed-Din (Barbarossa), as the church records show, and again destroyed in 1594 by the Turks. Population, in 1901, of commune, 9930.

FON′DLEWIFE. One of the principal characters in Congreve's *Old Bachelor.* He is a senile husband, so much in love with his apparently docile wife that she finds little difficulty in deceiving him.

FOND′LOVE, Sir William. In Knowles's *Love Chase*, a foolish old baronet, the chosen prey of the Widow Green.

FOND DU LAC, fŏn′ dụ lăk′ (Fr., head of the lake; so called from the situation of the city). A city and the county-seat of Fond du Lac County, Wis., 63 miles north by west of Milwaukee; on Lake Winnebago, at the mouth of the Fond du Lac River, and on the Chicago and Northwestern, the Wisconsin Central, and the Chicago, Milwaukee and Saint Paul railroads (Map: Wisconsin, E 5). Through Lake Winnebago and Fox River there is communication by water with the Great Lakes. The city is picturesquely situated, and has the Grafton Hall School for Girls (Protestant Episcopal), Saint Agnes Hospital and Sanatorium, a public library, and Lakeside and Taylor parks. There are important manufactures, and a trade in lumber, grain, flour, paper, machinery, refrigerators, furniture, carriages, agricultural implements, etc. Fond du Lac was settled in 1836, and was incorporated as a village in 1847 and chartered as a city in 1852. Under a revised charter of 1891 the government is vested in a mayor, annually elected, and a council, which elects the board of education and confirms the mayor's nominations to administrative offices. Population, in 1890, 12,024; in 1900, 15,110.

FONSAGRADA, fôn′sȧ-grä′ᴅȧ. A town in the Province of Lugo, Spain, about 25 miles east by north of Lugo. It is situated in a mountainous region, with fertile valleys, and is engaged principally in stock-raising, dairying, and agriculture. There are some manufactures. Population, in 1900, 17,448.

FONSECA, fôn-sā′kȧ, Gulf of (called *Chorotega* by the American Indians). An inlet of the Pacific Ocean, situated in a volcanic region between the three Central American States of Salvador, Honduras, and Nicaragua (Map: Central America, D 4). It is nearly 20 miles long and over 40 miles wide, containing a number of islands, and receives the waters of numerous rivers.

FONSECA, Antonio Manoel da (1796-1893). A Portuguese artist, born at Lisbon. He studied at the Academy of Lisbon, under Sousa Loureiro, afterwards became a professor in that institution, and in 1839 was appointed Court painter. In 1862 he was elected a corresponding member of the Academy of Fine Arts at Paris. Many of his works were exhibited at the Paris Exposition of 1855. They include chiefly historical scenes and portraits, such as "The Death of Albuquerque," "Christ in the Midst of the Doctors." "Christ Driving the Money-Changers from the Temple," "King Ferdinand," and "King Pedro V."

FONSECA, Juan Rodriguez (1451-1524). A Spanish prelate, born at Toro, Province of Seville. He became Archdeacon of Seville, Bishop successively of Badajoz, Cordova, Palencia, Conde, and Burgos, Archbishop of Rosano, Italy, and principal chaplain to Isabella and later to King Ferdinand. He was appointed head of the Department of Affairs in the Indies, organized by the sovereigns in 1493, with headquarters at Seville. Although possessed of some administrative ability, he was jealous of Columbus, and when, during the preparations for the Admiral's second voyage, a quarrel arose between them and he was instructed to obey Columbus, his jealousy increased to absolute hatred. In the fitting out of the expeditions he sought only to delay and annoy; he encouraged insolence and insubordination among the crews, and he caused worthless deserters from the colonies to present complaints at Court against the Admiral. It was through him also that Francisco de Bobadilla (q.v.) was sent out to make investigations at Hispaniola. He afterwards hampered Cortes and Las Casas in similar fashion, and was extremely cruel in his attitude toward the Indians.

FONSECA, Manuel Deodoro da (1827-92). The first President of the Republic of Brazil. He was born at Alagoas, Brazil; was educated at the military school at Rio Janeiro, and was commissioned a lieutenant of artillery in 1849. He took a prominent part in the war with Paraguay in 1868-70, and was promoted to the rank of division general. About 1881 he became imbued with republican ideas, and organized the Military Club at Rio Janeiro. Fonseca's activity and pronounced republicanism, although he was a warm personal friend of the Emperor, Dom Pedro, finally led in 1887 to his appointment as Governor of a frontier province, in order to remove him from the capital, where his influence was thought to be dangerous. Having returned to Rio de Janeiro in 1889, he entered actively into the schemes of the Republicans in army circles and in the newly established Republican League, which culminated, on November 15th of that year, in the dethronement of Dom Pedro and the establishment of the Republic of Brazil. Fonseca was chosen head of the Provisional Government. The new Constitution was proclaimed on February 24, 1891, and on the same day Fonseca was elected to a four years' term as the first President of the Republic. He became almost immediately involved in conflicts with the National Congress, which increased in bitterness until he finally, on November 3, 1891, dissolved Congress and proclaimed himself Dictator, placing the capital under martial law. The navy, remaining faithful to the Constitutional Party, turned the tide against him, and on November 23d the army also declared against him, and he was deposed and took no further part in public affairs.

FONSECA, Pedro da (1528-99). A Portuguese philosopher and theologian of the Jesuit Order, often called the *Portuguese Aristotle.* He was born at Cortizada, and was educated at the Jesuit chapter-house at Coimbra, and at the University of Evora, whence he returned to Coimbra as professor of philosophy. He rose high in his Order; was a Portuguese Minister in the reign of Philip II.; and was charged with several important missions by Gregory XIII. In letters he is best known for his studies of Aristotle—*Institutiones Dialecticæ* (1564); *In Libros Metaphysicorum Aristotelis* (1577); and *Isagoge Philosophica* (1591). In dogma he made himself a name by his stress on God's prevision, and the attempt, further carried out by Molina, his pupil, to obviate the apparent clash between predestination and free will.

FONSECA BENEVIDES, bā′nâ-vē′dâz, Francisco da (1835—). A Portuguese scientist and author. He was born at Lisbon, the son of a physician, and studied medicine. He entered the navy in 1851, at the age of nineteen became professor of physics in the industrial school at Lisbon, and a year later (1855) entered the faculty of the Naval Academy. He was made a member of the Lisbon Academy in 1866, and was sent by the Government to various national expositions, and he exhibited some of his scientific apparatus at Paris in 1878. In 1884 he was made inspector of the Portuguese industrial schools. He founded the Lisbon Industrial Museum. Besides his contributions to Portuguese technical journals, he wrote: *Curso de artilheria* (1850); *Curso de physica* (1863); *Relatorio sobre a exposição de Paris em 1867* (1867); *Principios de optica* (1868); *O Fogo* (1869); *Noções de physica moderna* (last ed. 1880); *Elementos de balistica* (last ed. 1882); *Mémoire sur la vitesse de propagation des flammes* (1880); and the historical work, *As raïnhas de Portugal* (1878-79).

FONSECA LIMA E SILVA, lē′mȧ ȧ sêl′vȧ, MANOEL DA (1793-1862). A South American soldier, born at Rio de Janeiro. He entered the Portuguese Army in Brazil, joined the movement for the independence of the country, and was commissioned lieutenant-colonel and appointed Lord Chamberlain to the Emperor Pedro I. In 1828 he was promoted to be brigadier, and in 1831, when Pedro I. was compelled to abdicate, identified himself with the Liberals. He was appointed Minister of War in 1831, and again in 1835; was Acting Minister of the Navy in 1835-36, and Minister of the Interior in 1836-37. In 1851 he became general and commander-in-chief of the army.

FONT (Lat. *fons*, fountain; probably connected ultimately with *fundere*, Gk. *χεῖν*, *chein*, Goth. *giutan*, AS. *gēotan*, OHG. *giozan*, Ger. *giessen*, Skt. *hu*, to pour). The vessel used in churches as the repository of the baptismal water. In the early Christian period, while immersion continued to be the ordinary form of the administration of the sacrament of baptism, the baptistery (q.v.), or other place set apart for the ceremony, was furnished with a basin sufficiently capacious to admit of the administration of the rite. But when it became customary to baptize by pouring the water on the head of the person to be baptized, the size of the basin was naturally diminished, and eventually it assumed the dimensions and the form which are now familiar to us in most of the mediæval churches in Great Britain and upon the Continent, thus doing away with the necessity for a separate building to contain it.

The earliest traditional example of a baptismal font is the great porphyry basin in the baptistery of Constantine in Rome, supposed since the early Middle Ages to have been that in which the Emperor was baptized. The baptismal font in its original form, as found in early baptisteries from the fourth to the tenth century, consists of a large basin, usually of octagonal form, with three steps, set below the pavement of the building, like the piscina of the Roman baths, and surrounded by a high veil (see BAPTISTERY). During the Romanesque period a radical change took place. The basin was raised above the floor-level, and instead of being built up, was usually hollowed out of a single block of marble, the exterior surface, between three and four feet high, being carved with appropriate religious subjects in relief. The North European schools were famous for their large bronze fonts, preeminent among which are those of Lambert Patras for Saint Bartholomew at Liège and for the Cathedral of Merseburg. Such fonts averaged from eight to twelve feet in diameter. The fonts for baptism by affusion are smaller basins, raised on a base. They are of varying form: square, octagonal, cylindrical, hexagonal, the interior bowl being always round, and seldom exceeding two feet in diameter. The bowl was supported usually by a heavy cylindrical shaft, often flanked by four or more minor shafts, sometimes by a square pier. As the Gothic period advanced, fonts became of decreasing importance and size, and of simpler decoration.

In the Roman Catholic Church the service of Holy Saturday contains a solemn form for the blessing of the water to be used in baptism. After a series of prayers, and amid a very imposing ceremonial, the 'chrism,' or consecrated oil blessed by the bishop, and also the so-called 'oil of catechumens,' are mingled with the baptismal water, which is reserved for subsequent use. With a view to the preservation of the water thus reserved, the font, especially when it is of porous stone, is sometimes lined with lead; and from an early date it is furnished with a lid, which is secured by a lock, and is often of a highly ornamental character. The ordinary place of the font is at the western end of the nave, near the entrance of the church, but in many cases it stands in a separate chapel, or a baptistery, or at least in a compartment screened off for the purpose. Even when it stands in the open nave it is properly inclosed by a rail. Consult: Paley, *Illustrations of Baptismal Fonts* (London, 1844); Simpson, *Series of Ancient Baptismal Fonts* (London, 1844); Corblet, *Histoire du sacrement du baptême* (Paris, 1882).

FONTAINE, fôɴ′tân′, CHARLES (1515-89). A French poet. He was born in Paris, but lived in Lyons for the greater part of his life. Devoted to poetry from his boyhood, his first published work of any importance was *Le Quintil Horatien* (1551), wherein with conservative enthusiasm he opposed the more advanced school of poets forming the 'Pléiade.' His other published works are: *Les ruisseaux de Fontaine* (1555); a translation of *Vingt et une épîtres d'Ovide* (1556); *Les dicts des sept sages* (1557); *Odes, énigmes et épigrammes* (1557).

FONTAINE, JEAN DE LA. See LA FONTAINE, JEAN DE.

FONTAINE, PIERRE FRANÇOIS LÉONARD (1762-1853). A French architect. When young, he went to Rome, where his connection with Percier began, which lasted for many years. After their return to Paris they became Napoleon's architects, restored the Imperial châteaux and palaces (Saint-Cloud, Versailles, Compiègne, Louvre, Tuileries), and built the Carrousel Arch of Triumph. The partnership having been dissolved on the fall of Napoleon, Fontaine remained Court architect under Louis XVIII., Charles X., and Louis Philippe. He published a number of architectural books, with Percier and alone.

FONTAINEBLEAU, fôɴ′tân′blō′. The capital of an arrondissement in the Department of Seine-et-Marne, France, beautifully situated in the midst of an extensive forest, near the left bank of the Seine, 35 miles southeast of Paris (Map: France, J 3). The Forest of Fontainebleau, covering an area of 64 square miles, is renowned for its beauty, and is regarded as one of the most picturesque forests of France. There are two hospitals, a library, a theatre, and a monument to President Carnot. Grapes, famous for their fine quality, are largely cultivated; porcelain and earthenware are manufactured. Population, in 1901, 14,160.

Fontainebleau is chiefly famous for its château, or pleasure palace, of the kings of France. It is said to have been originally founded by Robert the Pious toward the end of the tenth century. It was rebuilt in the twelfth century by Louis VII., of whom, and of Philip Augustus, it was a favorite residence and hunting seat. It was enlarged by Louis IX. and his successors.

The old castle was razed in 1527 by Francis I., who planned a pleasure palace less grim, and more in harmony with the new life of the Renaissance. The plans were drawn up in 1528, probably by Giles le Breton, who carried them out only in part in the *Cour du Cheval Blanc*, the *Galerie de François I.*, and the *Galerie d'Henri II.*, and the peristyle of the *Cour Ovale.* The main portions were built shortly afterwards by Pierre Chambige and Pierre Gérard. Under Henry II. Philibert Delorme made additions, and the famous Italian artists, such as Primaticcio, Rosso, and Serlio, were called here to build and decorate. Their work here was so important as to give to this little group of artists the name of the School of Fontainebleau, whose influence spread widely over France. Royal favor was then for a time withdrawn, to be revived under Henry IV., for whom were executed the new *Galerie de Diane*, the *Place d'Armes*, and the beautiful grounds. To Louis XIII. considerable interior decoration was due. Under Louis XIV. the château was occupied by Madame de Montespan, but later the King deserted it for Versailles and Saint-Germain, except for a while during the autumn. It was again transformed under Louis XV., and occupied successively by Madame de Pompadour and Madame du Barry. Under Louis XVI. it was a favorite residence of Queen Marie Antoinette. Napoleon I. had the château renovated, and Louis Philippe restored it in the style of the sixteenth century.

Notwithstanding these later modifications, Fontainebleau remains, both in construction and decoration, one of the most superb works of the early and golden ages of the French Renaissance, with a tinge of special Italian influence. In the seventeenth century it was the residence of Christina of Sweden after her abdication; here for nearly two years Pope Pius VII. was detained a prisoner by Napoleon. Many State transactions and treaties are dated from Fontainebleau. Here Napoleon signed his abdication in 1814 and again in 1815. The palace has been restored, and is kept in perfect condition as a public monument. Consult: Pfnor, *Histoire et guide artistique au palais de Fontainebleau* (Paris, 1889); *Architecture et decoration au palais de Fontainebleau* (Paris, 1885); Palustre, *La Renaissance en France*, vol. i. (Paris, 1879); Haynes-Williams, *Fontainebleau* (New York, 1890), consisting of photogravures after pictures.

FONTAINEBLEAU, School of. A group of artists assembled by Francis I. at Fontainebleau, where they were chiefly employed in decorating the palace. There were two branches of the school, one of which was composed of the native artists, of whom the Clouets (q.v.) were the most important, and who were Flemish in technic. The other branch was composed of Italians. Francis invited Leonardo da Vinci to France (1516-19), but he died too soon to make his influence permanently felt. The chief founders of the school were Rosso dei Rossi (1495-1541) and Primaticcio (1504-70). Their influence dominated French art. The most prominent French representatives of the school were Jean Cousin (?-1500-1580) and Toussaint du Breuil (1561-1602). (See the articles on these painters.) The painters of the Barbison School (q.v.) are also called the School of Fontainebleau (or Fontainebleau-Barbison), because most of their subjects were taken from the forest of Fontainebleau, near which the village of Barbison lies. Consult: Roger-Ballu, "Le paysage français au XIX. siècle," in *Nouvelle Revue*, 1881; Mollet, *The Painters of Barbison* (London, 1890); Thompson, *The Barbison School of Painters* (ib., 1891).

FONTAN, fôɴ'täɴ', Louis Marie (1801-39). A French dramatic author, born at Lorient. His name first became known through the drama of *Perkins Warbeck* (1828). In 1829 he published an article against Charles X. and his family, which caused him to be sentenced to five years' imprisonment. The Revolution of 1830 liberated him, and he continued writing constantly for the stage, and generally with political intent. Among his plays are *Jeanne la folle* and *Le procès d'un maréchal de France* (1831).

FONTANA, fôn-tä'nȧ, Carlo (1634-1714). An Italian architect and archæologist, born at Bruciato, near Como. He studied in Rome under Bernini, and became one of his best pupils, but his work is heavy and ugly. He built the palaces of Grimazzi and Bolognetti, the tomb of Queen Christina in Saint Peter's, the great fountains of Saint Peter's and of Santa Maria in Trastevere, and the Church of San Michele a Ripa. He wrote several books of great interest, such as, *Il tempio vaticano e sua origine con gli edifici più cospicui antichi e moderni* (1694); *Utilissimo trattato delle acque correnti* (1696); and *L'anfiteatro Flavio* (1725).

FONTANA, fôn-tä'nä, Domenico (1543-1607). An Italian engineer and architect, born in 1543 at Mili, in the vicinity of Lake Como. At an early age he came to Rome, and soon attracted the notice of Cardinal Montalto, who appointed him his private architect, and intrusted to him the building of his villa, Negroni (c.1580), the Sistine chapel in Santa Maria Maggiore, and an adjoining palace. When the Cardinal's finances were crippled, through the jealousy of Gregory XIII., Fontana, out of his own funds, carried on the designs of his patron, on the same scale of magnificence in which they were commenced. For his disinterested devotion he received later ample reward, when the Cardinal, under the name of Sixtus V., was called to the Papal chair. Fontana, as a Papal architect (1585), was employed in a variety of important works, among which stands conspicuously the completion of the dome and lantern of Saint Peter's substantially upon Michelangelo's design, slightly modified by Della Porta. He increased his fame by the removal and reërection of the Egyptian obelisk, now in the piazza of Saint Peter's. He afterwards erected the obelisks in the Piazza del Popolo and the Lateran, and was intrusted by Sixtus with the construction of the Lateran palace, of a new façade for the transept of the basilica of Saint John Lateran, and of the famous Vatican library. The restoration of the columns of Trajan and Antoninus, and the construction of the aqueduct known as the Acqua Felice, with the fountain of the Acqua Paola, deserve mention among the many works of utility executed by Fontana. On the death of Sixtus, Fontana, through the intrigues of his enemies, was stripped of his post as Papal architect in 1592, but was immediately proffered a similar appointment in the Kingdom of Naples. During his sojourn in Naples he executed many imposing designs, the royal palace and a noble promenade along the bay being among the chief works. His conception of a grander harbor was carried into effect by others, his death in 1607 at Naples depriving the undertaking of his personal superintendence.

Fontana's son, GIUGLIO CESARE, heir to his father's great wealth, and some of his genius, was appointed royal architect on his decease. His brother, GIOVANNI FONTANA, (c.1540-1614), assisted him as engineer, landscape architect, and contractor, from the beginning of his career, and succeeded him as Papal architect when he left Rome in 1592. Another and later architect of the same name, CARLO FONTANA (1634-1714), was a pupil of Bernini, and built in Rome and elsewhere in the Baroque style. San Marcello and the Bolognetti and Grimani palaces in Rome, the Liechtenstein Villa in Vienna, and the Visconti Villa at Frascati are among his works. Consult: Milizia, *Le vite dei più celebri architetti* (Rome, 1768), translated by Cresy; *The Lives of Celebrated Architects, Ancient and Modern* (London, 1826). Modern authorities, with full illustrations, are Ebe, *Spät-Renaissance* (Berlin, 1886); and Strack, *Baudenkmäler Roms des 15-19 Jahrhunderts* (Berlin, 1891).

FONTANA, FELICE (1730-1805). A celebrated Italian physiologist. At the termination of an elaborate course of study carried on in the universities of Verona, Parma, Padua, and Bologna, he was appointed to the chair of philosophy in the University of Pisa by Francis I., Grand Duke of Tuscany. Leopold, on succeeding his father, appointed Fontana Court physiologist, and charged him with the organization of a museum of natural history and physiology, which comprises a superb collection of specimens of the animal, vegetable, and mineral kingdoms, besides an elaborate series of wax models, representing the human body as a whole, and each organ separately. A similar collection was prepared by Fontana for the Museum of Vienna by order of the Emperor Joseph II. His writings include: *Ricerche filosofiche sopra la fisica animale* (1781); *Dei moti dell' iride* (1765); *Traité sur le venin de la vipère et sur les poisons américains* (1781); and *Choix d'observations physiques et chirurgicales* (1785).

FONTANA, GIOVANNI (1540-1614). An Italian architect, born at Mili, on Lake Como, and the brother of Domenico, the great Italian architect. He went to Rome to study, where he was joined by his brother, and afterwards helped him in many of his buildings. He himself designed the not very remarkable palace of the Giustiniani. He did his most important work as a hydraulic engineer. He superintended the cleansing of the Tiber, built canals, restored the Cloaca Maxima, built the aqueducts at Loretto and Recanati, and erected the walls or parapets around the cascades at Tivoli.

FONTANA, LAVINIA (1552-1614). An Italian painter of the Bolognese school. She was the daughter and pupil of Prospero Fontana. She executed religious, historical, and mythological canvases, but was especially famous as a fashionable portrait painter. Her reputation, however, has waned. She lived at Bologna, then at Rome, where she was made a member of the Academy of Saint Luke. Among her best portraits are those of Pope Gregory XIII., and that of herself, in possession of Count Zappi da Imola. Her husband, Paolo Zappi, an amateur, assisted her in her painting.

FONTANA, PROSPERO (1512-97). An Italian painter of the Bolognese school. He belonged to the Mannerist group, having studied in Bologna under Innocenzio da Imola; he was, however, more influenced by the works of Vasari. Upon the recommendation of Michelangelo he was employed by Pope Julius III. at Rome, and afterwards assisted Primaticcio in decorating the Palace of Fontainebleau. The rest of his life was passed at Bologna, where he died in 1597. He exercised much influence upon the art of Bologna—of a detrimental nature, according to Lanzi—and numbered among his pupils the Carracci (q.v.), who deserted his methods, Calocert, and others. He was a painter of great facility, but of incorrect and negligent methods. His best works are at Bologna, and his portraits are better than his historical compositions.

FONTANE, fôɴ'tän', MARIUS (1838--). A French author, born at Marseilles. He became secretary to Ferdinand de Lesseps, who made him general secretary of the Suez Canal Company, and afterwards a member of the board of directors of the Panama Canal Company. Upon the revelations connected with the latter enterprise he was condemned to two years' imprisonment, but later was acquitted (1893). His publications enter many fields, and include: *Confidences de la vingtième année* (1863); *Sélim l'égorgeur* (1865); *La guerre d'Amérique* (2 vols., 1866); and *L'histoire universelle* (vol. i., 1881; vol. x., 1899; unfinished).

FONTANE, fôn-tä'ne, THEODOR (1819-98). A noteworthy German author, born at Neuruppin (Brandenburg). After study at the Industrial School of Berlin and three years (1840-43) spent as an apothecary's apprentice at Leipzig and Dresden, he turned to the more congenial activities of journalism and literature. He was an editor on the staff of the *Neue Preussische Zeitung* from 1860 to 1870, and from 1870 to 1889 wrote authoritatively as dramatic critic for the *Vossische Zeitung*. In 1870 he visited the scene of war in France, and was taken prisoner at Domrémy. He was a close student of the thought and literature of England, where he resided in 1844, 1852, and 1855-59, chiefly for the purpose of investigating the old ballads which had so important an effect upon his own earlier work as a poet. In 1876 he was elected first secretary of the Berlin Academy of Arts, and in 1891 received 3000 marks from the German Emperor in recognition of his services to German literature. He published two collections of verse: *Gedichte* (1851, 7th ed. 1901), and *Balladen* (1861), of whose contents such poems as "Archibald Douglas," done in the very spirit of their English prototypes, placed him among the foremost modern ballad writers. Volumes based on his observations in Great Britain—*Aus England* (1860); *Jenseit des Tweed* (1860)—or on the Franco-Prussian War—*Kriegsgefangen* (1871, 5th ed. 1900); *Der Krieg gegen Frankreich* (1873-75)—were much esteemed in Germany, and his *Wanderungen durch die Mark Brandenburg* (1861-82, numerous subsequent editions) established him as the peculiar interpreter of that region. It was from Brandenburg also that he drew the material for many in his series of works of fiction, which he began in 1878 with *Vor dem Sturm*, and closed with *Der Stechlin* (1899). His *Irrungen, Wirrungen* (1888, 6th ed. 1899) is credited with the introduction of what has become known as the Berlin type of fiction. It certainly allied him with the younger school, the so-called realists. But his realism was quite individual, and dominated by his own kindly personality. After the death of Freytag (1895) he occupied a position of distinguished prominence in German literature. No notice of him would be complete without mention of his reminiscences, *Meine Kinderjahre* (1894), and *Von Zwanzig bis Dreissig* (1898). Consult Servaes, *Theodor Fontane* (Berlin, 1900).

FONTANEL (Fr. *fontanelle*, diminutive for *fontaine*, fountain, from ML. *fontana*, fountain, from Lat. *fons*, fount). An artificial ulcer, formerly caused by physicians for its derivative effect. Any hard mass kept under the skin for a time will produce the necessary irritation, such as a dried pea bandaged into a cut in the skin. This causes a discharge of pus, formerly supposed to drain away the material of disease from another part of the body. The method and idea are obsolete. The term fontanel is also applied to one of the soft pulsating spots on the head of a very young infant. Of these there are three or four, the principal one being at the crossing of the sagittal and coronal sutures. This is the great or anterior fontanel. The next in importance is the posterior or bregmatic fontanel, at the junction of the sagittal and lambdoidal sutures. The others, called the sphenoidal and the mastoidal or Gasserian fontanels, close very soon after birth, while the posterior closes a few months, and the anterior about two years after birth. Synchronously with the pulse-beat, the brain pulsates through the fontanels, and may be fancied to resemble the water of a fountain.

FONTANES, fôɴ'tȧn', Louis, Marquis de (1757-1821). A French poet and political orator. He was born at Niort, March 6, 1757, and was of an ancient Protestant family of Languedoc. He went to Paris while still a youth, and at twenty-one had attracted attention as poet by *Le cri de mon cœur* (1778) and *La forêt de Navarre* (1778). A little later he published a scholarly translation of Pope's *Essay on Man* (1783). During the early years of the Revolution he was active as a moderate Republican journalist, and before the fall of Robespierre was in hiding for a time. Later he was constrained to take refuge in Hamburg, whence he went to London, and became a close friend of Châteaubriand. While in England he published a much-admired imitation of Gray's "Elegy," *Le jour des morts* (1796). He returned to France in 1799, was reinstated in the Institute, of which he had been made a member in 1795, and, warmly espousing the cause of Napoleon, was made member of the legislative body (1802-10), of which he became president in 1804. Here he developed great oratorical talent in praise of the First Consul and Emperor. He was advanced to the Senate (1810), but he adapted himself readily to the Restoration after Leipzig, drew up Napoleon's act of abdication (1814), and was made peer by Louis XVIII. He died in Paris, March 17, 1821. Fontane's works, edited by Sainte-Beuve in two volumes (1837), are models of elegant and correct diction, and show sound literary judgment.

FONTANGES, fôɴ'täɴzh', Marie Angélique de Scoraille de Roussille, Duchesse de (1661-81). A mistress of Louis XIV. She was born at the Château of Cropières in Auvergne, as the daughter of the Marquis de Roussille. Maid of honor to Madame, the Duchess of Orleans, she attracted the attention of the King, who made her Duchesse de Fontanges. She is said to have been beautiful, but most prodigal and extravagant, and her career was brief. She bore the King a son, and shortly afterwards died at the Abbey of Port Royal.

FON'TARA'BIA. See Fuenterrabia.

FONTENAY, fôɴt'nå'. A small town near Auxerre, in Lower Burgundy. It is memorable for the battle fought there in 841, between the three sons of Louis the Pious, which decided the fate of the Carolingian Empire. The Emperor Lothair, who was defeated, was obliged in 843 to consent to divide the Empire with his two brothers by the Treaty of Verdun (q.v.). From this treaty the kingdoms of modern France and Germany arose.

FONTENAY-LE-COMTE, fôɴt'nå'le-kôɴt'. The capital of an arrondissement in the Department of Vendée, France, situated on both banks of the Vendée, 27 miles northeast of La Rochelle (Map: France, E 5). It is an old-fashioned town, with the two fine Gothic churches of Notre Dame and Saint Jean, and in the public square a fountain in Renaissance style, from which the town derives its name; there are also a college and a handsome theatre. There are linen and cloth and saw mills, and three important annual fairs are held. Population, in 1901, 10,512. The town suffered considerably during the religious wars, and was captured by the Royalists in 1793.

FONTENAY-MAREUIL, fôɴt'nå'mȧ'rẽ'y', François du Val, Marquis de (c.1594-1665). A French soldier, diplomat, and historian. He was brought up at the Court of Louis XIII.; served with Mayenne in Spain; with Nevers at Ratisbon; under Boisdauphin at the siege of Soissons (1617); in 1619 in Normandy; at Saint-Jean d'Angély, Clérac, and Montauban (1621); at Saint-Antoine and Montpellier (1622); at the Ile de Ré (1627); and at the sieges of La Rochelle (1628), of Privas, and of Alais (1629). Then his diplomatic career began. He announced the capture of La Rochelle to the Duke of Savoy; escorted Montpensier to the Court; negotiated with Rohan; and from 1630 to 1633 was Ambassador to England. After taking part in various campaigns against the Imperialists and Spaniards, he was Ambassador at Rome from 1640 to 1650. His memoirs, published at Paris, 1826 (vol. i., of the first series of the *Collection Pettitot*), are both interesting and valuable.

FONTENELLE, fôɴt'nĕl', Bertrand le Bovier (1657-1757). A French scientist, philosopher, poet, and dramatist of acute wit and great power of popular presentation. He was born at Rouen, February 11, 1657, and was a nephew of Corneille. He was trained by the Jesuits, studied law, but abandoned it for literature and science, in which he soon earned distinction. He was secretary of the Academy of Sciences from 1699 to 1741, and edited its *Mémoires* and *Eloges* on deceased members with admirable care. His dramatic and poetic work is negligible, but his literary studies on the French stage before Corneille and the origin of fables are still of interest. His *Histoire des oracles* (1687), *Entretiens sur la pluralité des mondes* (1686), and the *Dialogues des* *morts* (1683), imitating Lucian and suggesting Landor, were once very popular, and aided in spreading the scientific and rationalistic spirit. He died in Paris, January 9, 1757. He had an acute mind, a dry, epigrammatic style, a calm judgment, a didactic temper, a kindly character. The best edition of his works is in 3 vols. (Paris, 1818). Consult Faguet, *Dix huitième siècle* (Paris, 1894), and the brief but acute criticism in Lanson, *Histoire de la littérature française* (5th ed., Paris, 1898).

FONTENOY, fôɴt′nwä′ (older form *Fontenet,* from Lat. *fontanus,* pertaining to springs, from *fons,* fountain). A village of Belgium, in the Province of Hainaut, five miles southwest of Tournai. Here, on May 11, 1745, the French, 55,000 strong, under Marshal Saxe, defeated an equal number of English, Hanoverians, and Dutch under the Duke of Cumberland. The fight was obstinate to the last, and was decided only by a smashing charge of the Household Troops and the famous Irish Brigade. The Allies lost 10,000 men, the French 7000. Coming at the same time as the threatened Stuart invasion, the defeat was a great blow to England.

FONTEVRAULT, fôɴ′te-vrō′ (Fons Ebraldi —the well of Saint Evrault). A town in the Department of Maine-et-Loire, France, on the Vienne, eight miles southeast of Saumur (Map: France, G 4). Population, in 1901, 2352. It is celebrated for the remains of the famous abbey founded in 1099 by Robert d'Arbrissel, a Breton monk. It consisted of five churches, a monastery, a nunnery, a magdaleneum, and a hospital. One church remains, a splendid example of twelfth-century architecture, of which only a part is now devoted to divine service. It contained the tombs of several members of the royal Plantagenet family of England, and still possesses the effigies of Henry II. and his Queen Eleanor of Aquitaine, of Richard Cœur de Lion, and of Isabella of Angoulême, wife of King John. The twelfth-century kitchen, the sixteenth-century chapter-house, the refectory, and the cloisters are of great archæological interest. In 1804 the buildings were inclosed by walls, and converted into a huge penitentiary and industrial prison for eleven neighboring departments, with accommodation for 2000 prisoners. Napoleon III., in 1867, occasioned a national outburst of indignation by offering the Plantagenet statues to Queen Victoria, a vandal act that was frustrated by the refusal of the prison director to deliver them to the English agent. Consult Edouard, *Fontevrault et ses monuments* (2 vols., Paris, 1875).

FONTEVRAULT, Order of. A monastic Order following the Benedictine rule, founded by Robert d'Arbrissel. He was born in 1047, and took his doctor's degree in Paris. As Vicar-General of the Diocese of Rennes, he devoted himself zealously to the extirpation of clerical concubinage and simony. Later he took up the life of a hermit in the forest of Craon, between Anjou and Brittany. The fame of his sanctity attracted disciples, whom in 1094 he formed into a community under the rule of Saint Augustine at La Roe. He received special permission from Pope Urban II. to preach the Crusade; but in 1099 he founded a community at Fontevrault (q.v.) for persons of both sexes who preferred a life of penance at home. As several houses developed, of which those for women were especially dedicated to the Blessed Virgin, Robert placed those for men also under the jurisdiction of the Abbess of Fontevrault as superior of the whole Order, representing the heavenly patroness. The first abbess was Hersende, a kinswoman of the Duke of Brittany. They were pledged to observe the Benedictine rule in its full rigor, not eating flesh even in sickness. Paschal II. confirmed the Order in 1106 and 1113. The founder died in 1117, after establishing numerous cloisters; more than sixty arose after his death on the same model, principally in France, though a few extended to England and Spain. The Order ultimately declined, in spite of the efforts at reform of three of its abbesses, Mary of Brittany (1477), Renée of Bourbon (1507), and Antoinette of Orleans (1571-1618), and finally became extinct.

FONT′HILL ABBEY. See Beckford.

FONTPERTIUS, fôɴ′pâr′tyụ′, Adalbert Frout de (1825—). A French writer, born at Rennes. He entered the marine artillery, but left it for the civil service, and was chief prefect of the Division of Eure-et-Loir, from 1853 to 1865. His writings include a number of essays for scientific and economic magazines, and two books on social subjects, besides *Etudes de littérature étrangère* (1859), *Les Français en Amérique,* and works upon Canada, the United States (1873), and the English in India.

FONVIELLE, fôɴ′vyĕl′, Louis Eugène, Knight of (1655-1711). A French pirate, born at Thouars (in the present Department of Deux-Sèvres). He turned buccaneer in 1677, and as a chief, in command of his own vessel, cruised among the West Indies, attacking and plundering the Spaniards. He was a lieutenant in the French Navy from 1679 to 1681, when he was elected principal chief of the buccaneers, whom he continued to hold in readiness to aid the French at Santo Domingo. When the French expedition against Cartagena was organized by Baron de Pointis in 1697 he commanded 600 buccaneers in the force placed at the disposal of the expedition by Ducasse, the Governor of Santo Domingo. In 1702 he helped Ducasse to defeat a superior English fleet under Admiral John Benbow. He accompanied the unsuccessful French expedition against Rio de Janeiro in 1710, and after his surrender was treacherously murdered by the Spaniards.

FONVIELLE, Wilfrid de (1828—). A French aëronaut, meteorologist, and author. He was born at Paris, and in his early life was a teacher of mathematics. Since 1858 he has been distinguished as an aëronaut. He made numerous balloon ascents with Tissandier for meteorological purposes, and in November, 1870, during the siege of Paris, he escaped from the city in a balloon, and proceeding to London gave a series of lectures on the benefits of a republican form of government. His principal scientific works are: *L'homme fossil* (1865); *Les merveilles du monde invisible* (1866); *Eclairs et tonnerres* (1867), translated into English under the title of *Thunder and Lightning; L'astronomie moderne* (1868); *Histoire de la lune* (1886); and *Mort de faim* (1886). An account of the balloon ascents made by Fonvielle, Glaisher, and others appeared in French in 1870, and an English translation was published in 1871 under the title of *Travels in the Air.* In addition to the above-mentioned works Fonvielle has written several political pamphlets, and *Aventures aëriennes* (1876) and *La prévision du temps* (1879).

FOO-CHOW, fo͞o′chou′. See Fu-chow.

FOOD (AS. *fōda*, Icel. *fœþi*, Goth. *fōdeins*, food; connected with Gk. *πατεῖσθαι*, *pateisthai*, to feed). The articles of animal and vegetable origin that form the diet of man. Sometimes this term includes also spices, vinegar, and similar articles which, strictly speaking, are not foods, but are more properly called food accessories or condiments. A study of food and the feeding of the body, i.e. nutrition, should include knowledge of the requirements and the chemical composition of the body, the chemical composition, the laws of energy and of the metabolism of matter. Account must be taken of methods of preparing and cooking foods, of the hygiene, the comparative pecuniary value, the quantities of foods eaten, etc. Some of these subjects require investigations by specially devised methods; others are carried on by the help of physiological chemistry, bacteriology, and other related sciences. From the standpoint of nutrition, food may be defined as substance that builds tissue or yields energy when taken into the body. The most healthful food is that which is best fitted to the needs of the user; the cheapest food is that which furnishes the largest amount of nutriment at the least cost. In general, the best food is that which is both the cheapest and the most healthful.

The substances that nourish the body are very similar in chemical composition to those that compose it. They are made up of from fifteen to twenty chemical elements, the most abundant of which are oxygen, hydrogen, carbon, nitrogen, calcium, phosphorus, and sulphur. The elements are combined in a great variety of ways in the compounds of both the food and the body. Five general classes of these substances are made as follows: Water, mineral matter, protein, fats, and carbohydrates, the first two of which are called inorganic, the other three organic. In addition to material supplied in food, the body requires the oxygen of the air for the oxidation of nutrients and the production of energy.

Inorganic Constituents. Water is the most abundant of the substances mentioned. It is a component part of all the tissues, and forms over 60 per cent. by weight of the body of the average man. Though very important physiologically, it neither builds tissue nor yields energy. Other food ingredients which yield little or no energy, and yet are indispensable to the body, are the mineral matters, i.e. those substances that remain as ash when body or food tissue is burned. They consist mainly of phosphate of lime or calcium phosphate, the mineral basis of bone, and numerous compounds of potassium, sodium, magnesium, and iron. They form only five or six per cent., by weight, of the body, and are found chiefly in the bones and the teeth, but are present in the other tissues and also in solution in the various fluids.

Organic Constituents. The organic compounds are so called because they occur principally in the organic, i.e. the animal and vegetable world. They all contain carbon, oxygen, and hydrogen, in varying proportions. Some also contain nitrogen, phosphorus, sulphur, or other elements. *Protein Group.*—The protein group includes all compounds that contain nitrogen; for example, the lean and gristle of meat, the white of eggs, and the gluten of wheat. Protein forms about 18 per cent., by weight, of the body of the average man. Among the protein constituents of foods, the albuminoids, being the true tissue-formers, are the most important. Protein is the organic basis of bone, muscle, and other tissues, and is essential to the body structure. It is also used as fuel—that is, is burned in the body to yield energy—and is to some extent transformed into fat and stored in the body, but these are its less important uses. The protein compounds are most abundant in some of the animal foods, as lean meat, though the cereals contain them in considerable, and dried peas and beans in large, proportions. *Fats.*—Fats occur chiefly in animal foods, as meats, fish, butter, etc., but in considerable quantities in some cereals, notably oatmeal and maize (whole kernel), and in various nuts. They are also abundant in some vegetable products, such as olives and cottonseed, from which they are expressed as oil. In our bodies, and in those of animals, fats occur in minute particles scattered through the various tissues, and in masses under the skin, and in other localities. The amount of fat in the body varies greatly with food, exercise, age, and other conditions. When more food is taken than is necessary for immediate use, part of the surplus may be stored in the body. The protein and fat of food may thus become body protein and body fat; sugar and starch of food are changed to fat in the body and stored as such. When the food-supply is short, this reserve material is drawn upon for supplementary fuel. Fats form about 15 per cent., by weight, of the body of an average man. *Carbohydrates.*—The carbohydrates, which include such compounds as starches, different kinds of sugar, and the cellulose or fibre of plants, are found chiefly in the vegetable foods, like cereal grains and potatoes, form only a very small proportion of the body tissues—less than one per cent. Milk, however, contains considerable amounts of milk-sugar, which is a carbohydrate. Starches and sugars, which are very abundant in ordinary vegetable food materials, are important food substances, because they are easily digested, and because they form an abundant source of energy. They may be and often are transformed into fat in the body.

To a greater or less extent, the different nutrients can do one another's work. If the body has not enough of one kind of fuel, it can use another. But while protein may be burned in the body in the place of fats and carbohydrates, neither of the latter can take the place of the albuminoids in building and repairing the tissues. By being consumed themselves, however, they protect the albuminoids from consumption.

Refuse. Food as it is bought at the market, or even as it is served on the table, contains more or less of materials—such as the bones of meat and fish, the shells of eggs, and the skins and seeds of fruits and vegetables—which we cannot or do not eat, and which would have little or no nutritive value if we did eat them. In discussing the chemical composition of foods such portions are usually counted as refuse, but they make an important item when we consider the actual cost of the nutrients of food. The materials grouped together as refuse contain, in part, the same ingredients as the edible portion, though usually in very different proportions. Thus bones are largely mineral matter, with some fat and protein; egg-shells are almost entirely mineral matter; bran of wheat has a high content of fibre or woody material.

THE BODY AS A MACHINE. Blood and muscle, bone and tendon, brain and nerve—all the organs and tissues of the body—are built from the nutritive ingredients of food. With every motion of the body, with the exercise of feeling and of thought, material is consumed and must be resupplied by food. In a sense, the body is a superior machine, and, like other machines, it requires material to build up its several parts, to repair them as they are worn out, and to serve as fuel. In some ways it uses this material like a machine; in others it does not. The steam-engine gets its power from fuel; the body does the same. In the one case, coal or wood, in the other food, is the fuel. In both cases, the energy —the potential energy—which is latent in the fuel is transformed into heat and power. When coal is burned in a furnace, part of its potential energy is transformed into the mechanical power which the engine uses for its work; the rest is wasted in the heat that the engine does not utilize. Likewise the potential energy of the food is transformed in the body into heat and mechanical power. The mechanical power is employed for muscular work. The heat is used to keep the body warm, and when more is generated than is needed for that purpose it is wasted, as in the case of the engine. However, the body is much more economical in the use of fuel than any engine. One important difference between the human machine and the steam-engine is that the former is self-building, self-repairing, and self-regulating. Another is that the material of which the engine is built is very different from that which it uses for fuel, but part of the material which serves the body for fuel also builds it up and keeps it in repair. Furthermore, the body can use its own substance for fuel; the steam-engine cannot.

The fuel value of food may be readily determined by burning samples in a bomb calorimeter, in an atmosphere of oxygen to secure ready and complete combustion. The heat given off passes through the walls of the bomb, and is taken up by a known volume of water of known temperature. From the increase in the temperature of the water the amount of heat liberated is calculated. The unit commonly used to express the energy value of food is the calorie, i.e. the amount of heat which would raise the temperature of one kilogram of water 1° C., or, what is nearly the same thing, one pound of water 4° F. Instead of this, a unit of mechanical energy, the foot-ton, for instance, may be used. This represents the force required to raise a weight of one ton to the height of one foot. One calorie is equal to very nearly 1.54 foot-tons; that is to say, one calorie of heat, when transformed into mechanical power, would suffice to lift one ton 1.54 feet. Taking our common food materials as they are used in ordinary diet, the following general estimate has been made for the energy furnished to the body by one gram or one pound of each of the classes of nutrients:

Protein, fuel value, 4 calories per gram, or 1820 calories per pound.

Fats, fuel value, 8.9 calories per gram, or 4040 calories per pound.

Carbohydrates, fuel value, 4 calories per gram, or 1820 calories per pound.

When we compare the nutrients in respect to their fuel value—that is, their capacities for yielding heat and mechanical power—it will be seen that a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would be required to equal a pound of the fat of meat or butter or of body fat.

What has thus far been said about the ingredients of food, and the ways they are used in the body, may be briefly summarized in the following scheme:

NUTRITIVE INGREDIENTS (OR NUTRIENTS) OF FOOD

Food as purchased contains:	Edible portion. e.g. flesh of meat, yolk and white of eggs, wheat flour, etc.	Water.	
		Nutrients	Protein. Fats. Carbohydrates. Mineral matters.
	Refuse. e.g. bones, entrails, shells, bran, etc.		

USES OF NUTRIENTS IN THE BODY

Protein e.g. white (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.	Forms tissue	All serve as fuel to yield energy in the forms of heat and muscular power.
Fats e.g. fat of meat, butter, olive oil, oils of corn and wheat, etc.	Are stored as fat	
Carbohydrates e.g. sugar, starch, etc.	Are transformed into fat	
Mineral matter (ash) e.g. phosphates of lime, potash, soda, etc.	Share in forming bone, assist in digestion, etc.	

The following table shows the average composition of a number of the more common materials. For the composition of others, see BUTTER; EGGS; FRUIT; MEAT; MILK; CHEESE; NUTS; VEGETABLES; WHEAT; CORN; BUCKWHEAT; FIGS; etc.

DIGESTIBILITY. Not only is composition considered in valuing a food, but digestibility also. Digestibility is a term used to indicate the ease or difficulty with which a food parts with its nutrients to the body in passing through the digestive tract. The changes which food undergoes in digestion are brought about by ferments which are secreted by the digestive organs. (See

TABLE I.—AVERAGE COMPOSITION OF SOME COMMON AMERICAN FOOD PRODUCTS

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbo-hydrates	Ash	Fuel value per pound
ANIMAL FOOD	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Beef, fresh:							
Chuck ribs	16.3	52.6	15.5	15.0	......	0.8	910
Porterhouse steak	12.7	52.4	19.1	17.9	......	.8	1,100
Sirloin steak	12.8	54.0	16.5	16.1	......	.9	975
Round	7.2	60.7	19.0	12.8	......	1.0	890
Rump	20.7	45.0	13.8	20.2	......	.7	1,090
Shank, fore	36.9	42.9	12.8	7.3	......	.6	545
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	......	4.6	1,245
Dried, salted, and smoked	4.7	53.7	26.4	6.9	......	8.9	790
Canned corned beef	......	51.8	26.3	18.7	......	4.0	1,270
Veal:							
Breast	21.3	52.0	15.4	11.0	......	.8	745
Leg	14.2	60.1	15.5	7.9	......	.9	625
Leg cutlets	3.4	68.3	20.1	7.5	......	1.0	695
Mutton:							
Flank	9.9	39.0	13.8	36.9	......	.6	1,770
Leg, hind	18.4	51.2	15.1	14.7	......	.8	890
Loin chops	16.0	42.0	13.5	28.3	......	.7	1,415
Lamb:							
Breast	19.1	45.5	15.4	19.1	......	.8	1,075
Leg, hind	17.4	52.9	15.9	13.6	......	.9	860
Pork, fresh:							
Ham	10.7	48.0	13.5	25.9	......	.8	1,320
Loin chops	19.7	41.8	13.4	24.2	......	.8	1,245
Shoulder	12.4	44.9	12.0	29.8	......	.7	1,450
Tenderloin	......	66.5	18.9	13.0	......	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked	13.6	34.8	14.2	33.4	......	4.2	1,635
Shoulder, smoked	18.2	36.8	13.0	26.6	......	5.5	1,335
Salt pork	......	7.9	1.9	86.2	......	3.9	3,555
Bacon, smoked	7.7	17.4	9.1	62.2	......	4.1	2,715
Soups:							
Celery, cream of	......	88.6	2.1	2.8	5.0	1.5	235
Beef	......	92.9	4.4	.4	1.1	1.2	120
Meat stew	......	84.5	4.6	4.3	5.5	1.1	365
Tomato	......	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	......	.7	305
Fowls	25.9	47.1	13.7	12.3	......	.7	765
Goose	17.6	38.5	13.4	29.8	......	.7	1,475
Turkey	22.7	42.4	16.1	18.4	......	.8	1,060
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	......	.8	220
Halibut, steaks or sections	17.7	61.9	15.3	4.4	......	.9	475
Mackerel, whole	44.7	40.4	10.2	4.2	......	.7	370
Perch, yellow dressed	35.1	50.7	12.8	.7	......	.9	275
Shad, whole	50.1	35.2	9.4	4.8	......	.7	380
Shad, roe	......	71.2	20.9	3.8	2.6	1.5	600
Fish, preserved:							
Cod, salt	24.9	40.2	16.0	.4	......	18.5	325
Herring, smoked	44.4	19.2	20.5	8.8	......	7.4	755
Fish, canned:							
Salmon	......	63.5	21.8	12.1	......	2.6	915
Sardines	*5.0	53.6	23.7	12.1	......	5.3	950
Shellfish:							
Oysters, 'solids'	......	88.3	6.0	1.3	3.3	1.1	225
Clams	......	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	200
Lobsters	61.7	30.7	5.9	.7	.2	.8	145
Eggs: Hens' eggs	†11.2	65.5	13.1	9.3	......	.9	635
Dairy products, etc.:							
Butter	......	11.0	1.0	85.0	......	3.0	3,410
Whole milk	......	87.0	3.3	4.0	5.0	.7	310
Skim milk	......	90.5	3.4	.3	5.1	.7	165
Buttermilk	......	91.0	3.0	.5	4.8	.7	160
Condensed milk	......	26.9	8.8	8.3	54.1	1.9	1,430
Cream	......	74.0	2.5	18.5	4.5	.5	865
Cheese, Cheddar	......	27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream	......	34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD							
Flour, meal, etc.:							
Entire-wheat flour	......	11.4	13.8	1.9	71.9	1.0	1,650
Graham flour	......	11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process:							
High-grade and medium	......	12.0	11.4	1.0	75.1	.5	1,635
Low-grade	......	12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc	......	10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food	......	9.6	12.1	1.8	75.2	1.3	1,680
Buckwheat flour	......	13.6	6.4	1.2	77.9	.9	1,605
Rye flour	......	12.9	6.8	0.9	78.7	.7	1,620
Corn meal	......	12.5	9.2	1.9	75.4	1.0	1,635
Oat breakfast food	......	7.7	16.7	7.3	66.2	2.1	1,800
Rice	......	12.3	8.0	.3	79.0	.4	1,620
Tapioca	......	11.4	.4	.1	88.0	.1	1,650
Starch	......	......	......	......	90.0	......	1,675

* Refuse, including oil.

† Refuse, shell.

FOOD MATERIALS (AS PURCHASED)	Refuse	Water	Protein	Fat	Carbo-hydrates	Ash	Fuel value per pound
VEGETABLE FOOD—CONTINUED	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Bread, pastry, etc.:							
White bread	......	35.3	9.2	1.3	53.1	1.1	1,200
Brown bread	......	43.6	5.4	1.8	47.1	2.1	1,040
Graham bread	......	35.7	8.9	1.8	52.1	1.5	1,195
Whole-wheat bread	......	38.4	9.7	.9	49.7	1.3	1,130
Rye bread	......	35.7	9.0	.6	53.2	1.5	1,170
Sugars, etc.:							
Molasses	......	......	......	......	70.0	......	1,225
Candy*	......	......	......	......	96.0	......	1,680
Honey	......	......	......	......	81.0	......	1,420
Sugar, granulated	......	......	......	......	100.0	......	1,750
Maple sirup	......	......	......	......	71.4	......	1,250
Vegetables: †							
Beans, dried	......	12.6	22.5	1.8	59.6	3.5	1,520
Beans, Lima, shelled	......	68.5	7.1	.7	22.0	1.7	540
Beans, string	7.0	83.0	2.1	.3	6.9	.7	170
Beets	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage	15.0	77.7	1.4	.2	4.8	.9	115
Celery	20.0	75.6	.9	.1	2.6	.8	65
Corn, green (sweet), edible portion	......	75.4	3.1	1.1	19.7	.7	440
Cucumbers	15.0	81.1	.7	.2	2.6	.4	65
Lettuce	15.0	80.5	1.0	.2	2.5	.8	65
Onions	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	230
Peas (*Pisum sativum*) dried	......	9.5	24.6	1.0	62.0	2.9	1,565
Peas (*Pisum sativum*), shelled	......	74.6	7.0	.5	16.9	1.0	440
Cowpeas, dried	......	13.0	21.4	1.4	60.8	3.4	1,505
Potatoes	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb	40.0	56.6	.4	.4	2.2	.4	60
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	440
Spinach	......	92.3	2.1	.3	3.2	2.1	95
Squash	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes	......	94.3	.9	.4	3.9	.5	100
Turnips	30.0	62.7	.9	.1	5.7	.6	120
Vegetables, canned:							
Baked beans	......	68.9	6.9	2.5	19.6	2.1	555
Peas (*Pisum sativum*), green	......	85.3	3.6	.2	9.8	1.1	235
Corn, green	......	76.1	2.8	1.2	19.0	.9	430
Succotash	......	75.9	3.6	1.0	18.6	.9	425
Tomatoes	......	94.0	1.2	.2	4.0	.6	95
Fruits, berries, etc., fresh ‡							
Apples	25.0	63.3	.3	.3	10.8	.3	190
Bananas	35.0	48.9	.8	.4	14.3	.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	.4	295
Oranges	27.0	63.4	.6	.1	8.5	.4	150
Pears	10.0	76.0	.5	.4	12.7	.4	230
Raspberries	......	85.8	1.0	......	12.6	.6	220
Strawberries	5.0	85.9	.9	.6	7.0	.6	150
Fruits, dried:							
Apples	......	28.1	1.6	2.2	66.1	2.0	1,185
Apricots	......	29.4	4.7	1.0	62.5	2.4	1,125
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs	......	18.8	4.3	.3	74.2	2.4	1,280
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,265
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	915
Cocoanuts	§48.8	7.2	2.9	25.9	14.3	.9	1,295
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,465
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Walnuts, black	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:							
Chocolate	......	5.9	12.9	48.7	30.3	2.2	5,625
Cocoa, powdered	......	4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water) ¶	......	98.2	.2	......	1.4	.2	30

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* Plain confectionery not containing nuts, fruit, or chocolate.

† Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and cannot be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

‡ Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

§ Milk and shell.

¶ The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

Alimentary System; Digestion.) The ptyalin of saliva in the mouth has the power of changing insoluble starches into sugar. The food does not remain in the mouth for a long time, but nevertheless the action of the saliva is considerable. Saliva also helps to prepare the food for the stomach by moistening it and making its texture such that the gastric juices of the stomach may readily act upon it. The gastric juice acts upon protein, the pancreatic juice of the intestine (see Pancreas) upon protein, fat, and carbohydrates. All the digestive juices are assisted by a fine division of the food in chewing and by muscular contractions, called the peristaltic action of the stomach and intestine. These latter motions help to mix the digestive juices and their ferments with the food. The otherwise insoluble nutrients of food are rendered soluble by digestion. The digested food finds its way through the walls of the alimentary canal, and in this passage and later undergoes remarkable changes. When finally the blood, supplied with nutrients of the digested food and laden with the oxygen from the lungs, is propelled from the heart all over the body, it is ready to furnish the organs and tissues with the materials and energy needed for the various functions. At the same time it carries away the waste which the exercise of these functions has produced. The living body tissue has the power of choosing the necessary materials from the blood and building them into its own structure. Just how this is done cannot be explained. That portion of the food which the digestive juices cannot dissolve, or which for some reason escapes digestion, is periodically excreted as fæces. This material includes not only indigestible material and particles of undigested food, but also the so-called metabolic products, i.e. residues of the digestive juices, bits of the lining of the alimentary canal, etc. For discussions of other excretory products, see Urine; Sweat; Respiration.

The digestibility of any food may be learned most satisfactorily by experiments with man, although experiments are also made by methods of artificial digestion. In the experiments with man both food and fæces are analyzed. Deducting the amounts of the several nutrients in the fæces from the total amounts of each nutrient consumed shows how much of each was digested. The results are usually expressed in percentages, and spoken of as coefficients of digestibility. From a large number of experiments with man it has been calculated that on an average the different groups into which food may for convenience be divided have the following coefficients of digestibility and fuel value per pound:

Table II.—Coefficients of Digestibility and Fuel Value Per Pound of Nutrients in Different Groups of Food Materials

KIND OF FOOD	Protein		Fat		Carbohydrates	
	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound	Digestibility	Fuel value per pound
	Per cent.	*Calories*	*Per cent.*	*Calories*	*Per cent.*	*Calories*
Meats and fish	97	1,940	95	4,040	98	1,730
Eggs	97	1,980	95	4,090	98	1,730
Dairy products	97	1,940	95	3,990	98	1,730
Animal food (of mixed diet)	97	1,940	95	4,050	98	1,730
Cereals	85	1,750	90	3,800	98	1,860
Legumes (dried)	78	1,570	90	3,800	97	1,840
Sugars	...	....	.....	....	98	1,750
Starches	...	....	.....	....	98	1,860
Vegetables	83	1,410	90	3,800	95	1,800
Fruits	85	1,520	90	3,800	90	1,630
Vegetable foods (of mixed diet)	84	1,840	90	3,800	97	1,820
Total food (of mixed diet)	92	1,820	95	4,050	97	1,820

By the aid of these factors and the figures for the composition of food, the digestible nutrients in different materials may be calculated, as has been done in Table III. In making the calculations the further assumption is made that 75 per cent. of the ash is digestible.

As a general rule, carbohydrates are more completely digested than protein and fats, and hence are more fully available for use in the body; and protein of animal foods, as meat, fish, milk, and eggs, is more digestible than that of vegetable foods. Fats are probably less digestible than most forms of protein and carbohydrates. Other things being equal, foods furnishing nutrients which can be most easily and completely utilized by the body are the most desirable, since they will not bring unnecessary exertion to the various organs. Many kinds of food which in their natural state hold the most valuable nutrients in such form that the digestive juices cannot easily work upon them are so changed by the heat of cooking that they become easily digestible. Thus the importance of proper cooking can hardly be overestimated. Things which please the palate stimulate the flow of the digestive juices; for this reason food should be made appetizing. An attractive diet pleases the æsthetic sense; hence refinement in food habits is as desirable as in other phases of our daily life. The sense of comfort and satisfaction produced by even the appearance of food well cooked and served is of indisputable value. Fortunately such satisfaction is within the reach of almost all.

Ease and Quickness of Digestion. The terms digestible, indigestible, etc., as used above, refer simply to the food which is or is not available for the general nourishment of the body after the process of digestion is completed. In common parlance, however, they are used more loosely as referring to the ease and quickness of digestion, and to the general wholesomeness of food. One kind of food, bread, for instance, is spoken of as 'simple' and 'digestible,' and another, like fruit cake, as 'rich' and 'indigestible.' There is often much practical truth behind such statements, though little is definitely known concerning the time or labor required to digest different kinds of food. Food does not ordinarily

TABLE III.—DIGESTIBLE NUTRIENTS AND AVAILABLE ENERGY OF SOME COMMON FOODS

KIND OF FOOD MATERIALS	Refuse	Water	Total indigestible nutrients	Digestible nutrients				Fuel value per pound
				Protein	Fat	Carbo-hy-drates	Ash	
ANIMAL FOOD	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Beef, fresh:								
Chuck, ribs	16.3	52.6	1.4	15.0	14.3	......	0.6	910
Loin, medium	13.3	52.5	1.6	15.6	16.6	......	.7	1,025
Ribs	20.8	43.8	1.8	13.5	20.0	......	.5	1,135
Round, medium	7.2	60.7	1.4	18.4	12.2	......	.8	890
Shoulder and clod	16.4	56.8	1.2	15.9	9.3	......	.7	715
Beef, dried and smoked	4.7	53.7	4.5	25.3	6.6	......	5.5	790
Veal:								
Cutlets, round	3.4	68.3	1.2	19.5	7.1	......	.8	695
Leg	14.2	60.1	1.1	15.0	7.5	......	.7	625
Mutton:								
Leg	18.4	51.2	1.4	14.6	14.0	......	.6	890
Loin	16.0	42.0	2.0	13.1	26.9	......	.5	1,415
Pork, fresh:								
Loin, chop	19.7	41.8	1.8	13.0	23.0	......	.6	1,245
Ham	10.7	48.0	1.9	13.1	24.6	......	.6	1,320
Pork, salted and smoked:								
Bacon	7.7	17.4	4.4	8.8	59.1	......	3.1	2,720
Ham	13.6	34.8	3.1	13.8	31.7	......	3.2	1,635
Salt, fat	....	7.9	5.4	1.8	81.9	......	2.9	3,555
Poultry:								
Fowl	25.9	47.1	1.2	13.3	11.7	......	.5	765
Turkey	22.7	42.4	1.6	15.6	17.5	......	.6	1,060
Fish, fresh:								
Cod, dressed	29.9	58.5	.5	10.8	.2	......	.6	220
Mackerel	44.7	40.4	.7	9.9	4.0	......	.5	370
Shellfish:								
Oysters, solids	....	88.3	.6	5.8	1.2	3.3	.8	225
Fish, preserved and canned:								
Cod, salt	24.9	40.2	5.1	15.5	.4	......	13.9	325
Salmon, canned	....	63.5	1.9	21.1	11.5	......	2.0	915
Eggs, uncooked	11.2	65.5	1.1	12.7	8.8	......	.7	635
Dairy products:								
Whole milk	....	87.0	.5	3.2	3.8	5.0	.5	310
Skim milk	....	90.5	.3	3.3	.3	5.1	.5	165
Cream	....	74.0	1.1	2.4	17.6	4.5	.4	865
Butter	....	11.0	4.9	1.0	80.8	......	2.3	3,410
VEGETABLE FOOD								
Cereals, etc.:								
Corn meal	....	12.5	3.3	7.8	1.7	73.9	.8	1,640
Oat breakfast food	....	7.8	5.1	14.2	6.6	64.9	1.4	1,800
Rye flour	....	12.9	2.9	5.8	.8	77.1	.5	1,620
Rice	....	12.3	2.9	6.8	.3	77.4	.3	1,625
Wheat flour, patent process	....	12.0	3.4	9.7	.9	73.6	.4	1,635
Wheat breakfast food	....	8.6	3.8	10.3	1.6	73.7	1.0	1,680
Bread, etc.:								
Bread, white wheat	....	35.3	2.9	7.8	1.2	52.0	.8	1,200
Crackers, cream	....	9.8	4.5	8.2	10.9	68.3	1.3	1,925
Vegetables:								
Beans, white, dried	....	12.6	7.9	17.5	1.6	57.8	2.6	1,520
Beets, fresh	20.0	70.0	.8	1.1	.1	7.3	.7	160
Cabbage	15.0	77.7	.6	1.2	.2	4.6	.7	115
Potatoes	20.0	62.6	1.2	1.5	.1	14.0	.6	295
Squash	50.0	44.2	.4	.6	.2	4.3	.3	100
Sweet potatoes, fresh	20.0	55.2	1.6	1.2	.5	20.8	.7	440
Tomatoes	....	94.3	.5	.7	.4	3.7	.4	95
Fruits:								
Apples	25.0	63.3	1.2	.3	.3	9.7	.2	190
Bananas	35.0	48.9	1.6	.7	.4	12.9	.5	260
Grapes	25.0	58.0	1.7	.9	1.1	13.0	.3	295
Oranges	27.0	63.4	1.0	.5	.1	7.7	.3	150
Strawberries	5.0	85.9	1.0	.8	.5	6.3	.5	150

pass from the stomach into the intestine until it has been reduced to a liquid or semi-liquid condition. The length of time required for different foods to leave the stomach has recently been studied by Penzoldt, among others, with healthy men. He found that the amount and consistency of food have a marked influence on the rate of digestion in the stomach. According to his investigations, fluids leave the stomach more rapidly than other materials. Hot drinks do not leave the stomach more quickly than cold ones, nor does the quantity have much effect. Solid matter in solution or suspension delays the passage of fluid from the stomach somewhat. The consistency of solid foods thus seem to have more effect upon digestibility than the amount consumed. The quantity eaten increases the length of time the material remains in the stomach, but not proportionally.

To select a few examples of the time required for foods to leave the stomach: Two eggs (raw, poached, or in the form of an omelet), seven ounces of sweetbreads, ten moderate-sized oysters, seven ounces of white fish or three and one-half ounces of white bread, cauliflowers, or cherries, each required two to three hours to digest. Eight and one-fourth ounces of chicken, nine ounces of lean beef, six ounces of boiled ham, three and one-half ounces of roast veal or beefsteak, five and one-third ounces of coarse bread, boiled rice, carrots, spinach, radish, or apple, left the stomach in three to four hours. Nine ounces of smoked tongue, three and one-half ounces of smoked beef, nine ounces of roast goose, five and one-third ounces of string-beans, or seven ounces of pease porridge, left the stomach in four to five hours.

Generally speaking, the most readily digested animal foods were materials of soft consistency. White meats—for example, chicken—leave the stomach more quickly than red meats or dark meats—for instance, duck. The method of cooking also exerts a very marked influence on stomach digestion. Fresh fish was found to be more readily digested than meats. As regards vegetable foods in general, the consistency and the amounts of solid material were again the principal factors affecting the time required for digestion in the stomach. Mealy potatoes, for instance, were more easily digested than waxy potatoes, and mashed potato more readily than potato cut up in pieces. Fine bread was more quickly digested than coarse bread. There was not much difference in the time required for bread-crust, bread-crumb, toast, new bread, and stale bread to digest in the stomach, provided all were equally well chewed.

It must be remembered that digestion continues in the intestine, and that the total time required for the digestion and absorption of the nutrients in any given food material is not shown by such experiments as those just mentioned. They find their chief application in prescribing a diet for invalids, as in such cases it is often desirable to require of the stomach only a limited amount of work.

Agreement of Food with Individuals. Digestibility is often confused with another very different thing, namely, the agreeing or disagreeing of food with the person who eats it. Different persons are differently constituted with respect to the chemical changes which their food undergoes and the effect produced, so that it may be literally true that 'one man's meat is another man's poison.' Milk is for most people a very wholesome, digestible, and nutritious food, but there are persons who are made ill by drinking it. They should avoid it. Some persons have to avoid strawberries. Indeed, cases in which the most wholesome kinds of food are hurtful to individual persons are, unfortunately, numerous. Every man must learn from his own experience what food agrees with him and what does not.

How much harm is done by the injurious compounds sometimes formed in the body from ordinarily wholesome foods is seldom realized. Physiological chemistry is revealing the fact that these compounds may affect even the brain and nerves, and that some forms of insanity are caused by products formed by the abnormal transformations of food and body material.

Metabolism Experiments. As already stated, a knowledge of food and its uses in the body is obtained from studies of composition, digestibility, etc., and from complicated experiments, in some of which the balance of income and outgo of matter and energy is studied. The latter are called metabolism experiments, the balance of matter being measured in terms of nitrogen, or of nitrogen and carbon, and sometimes other elements also, and the balance of energy being measured in terms of heat. In determining the balance of income and outgo of nitrogen, special attention is paid to the amounts of this constituent in food, urine, and fæces. When the balance of carbon is also taken into account, a respiration apparatus is very convenient and almost necessary. This apparatus permits of the measurement and analysis of the respiratory products, since these contain a large part of the carbon (as carbon dioxide) excreted from the body. Various forms of respiration apparatus have been devised within the last fifty years, among the most important being those invented by Pettenkofer and Voit, in Munich. They consist of metal-walled chambers, large enough for the subject (sometimes a man, sometimes a dog, sheep, or other animal) to live in comfortably for several days, and are furnished with devices for pumping air through, and measuring and analyzing it as it enters and as it leaves the chamber. With such an apparatus it is possible not only to measure all the food and excreta, but also the materials given off from the lungs in the breath, and to make accurate determination of the matter entering and leaving the body. A still more elaborate apparatus, by which not only all the matter passing in and out of the body may be measured, but also all the heat given off from it, is called a respiration calorimeter—that is, a machine for measuring both the respiratory products and the heat given off by the body. It is like the respiration apparatus, except that it is furnished with devices for measuring temperatures. Several have been built, the majority in Europe, within the last twenty years, among the most successful being those by Professor Rubner and Professor Rosenthal, in Germany, and that devised by Professors Atwater and Rosa in the United States. The latter form, which represents a great advance on any previously devised, was elaborated at Wesleyan University in connection with the nutrition investigations carried on under the auspices of the Office of Experiment Stations of the United States Department of Agriculture. Its main feature is a copper-walled chamber, seven feet long, four feet wide, and six feet four inches high. This is fitted with devices for maintaining and measuring a ventilating current of air, for sampling and analyzing this air, for removing and measuring the heat given off within the chamber, and for passing food and other articles. It is furnished with a folding bed, chair, and table, with scales and with appliances for muscular work, and has a telephone connection with the outside. Here the subject stays for a period of from three to twelve days, during which time careful analyses and measurements are made of all material which enters the body in the food, and of that which leaves it in the breath and excreta. Record is kept of the energy given off from the body as heat and muscular work. The difference between the material taken into and that given off from the body is called the balance of matter, and shows whether the body is gaining or losing material. The difference between the energy of the food taken and that of the excreta and the energy given off from the body as heat and muscular work is the balance of energy, and if correctly estimated should equal the energy of the body material gained or lost. With such apparatus it is possible to learn much of the real nutritive value of foods, and what effect different conditions of nourishment will have on the human body. In one experiment, for instance, the subject might be kept quite at rest, and in another do a certain amount of muscular or mental work, with the same diet as before. Then by comparing the results of the two the use which the body makes of its food under the different conditions could be determined. Or the diet might be slightly changed in one experiment, and the effect of this on the balance of matter and energy observed. Such methods and apparatus are very costly in time and money, but the results are proportionately more valuable than those from simpler experiments.

Dietaries and Dietary Standards. The information gained from a study of the composition and nutritive value of foods may be turned to practical account by using it in planning diets for different individuals or classes of individuals, or in estimating the true nutritive value of the food actually consumed by families or individuals. By comparing the results of many such investigations with the results of accurate physiological experimenting it is possible to learn about how much of each of the nutrients of common foods is needed by persons of different occupations and habits of life, and from this to compute standards representing the average requirements for food of such persons. The plan followed in making dietary studies is, briefly, as follows: Exact account is taken of all the food materials (1) on hand at the beginning of the study, (2) procured during the study, and (3) remaining at the end. The difference between the third and the sum of the first and second is taken as representing the amounts used. From the figures thus obtained the amount of the different food materials and the amount of the dif-

Table IV.—Food Consumption of Persons in Different Circumstances, and Proposed Dietary Standards

[Quantities per man per day]

SUBJECTS	Number of cases included in averages	Actually eaten			Digestible			Fuel value
		Protein	Fat	Carbohydrates	Protein	Fat	Carbohydrates	
		Gms.	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Gms.*	*Calories*
PERSONS WITH ACTIVE WORK								
Rowing clubs in New England	7	155	177	440	143	168	427	3,955
Bicyclists in New York	3	186	186	651	171	177	631	5,005
Football teams in Connecticut and California	2	226	354	634	208	336	615	6,590
Prussian machinist	1	139	113	677	128	107	657	4,270
Swedish mechanics	5	189	110	714	174	104	693	4,590
PERSONS WITH ORDINARY WORK								
Farmers' families in Eastern United States	10	97	130	467	89	124	453	3,415
Mechanics' families in United States	14	103	150	402	95	143	390	3,355
Laborers' families in large cities of United States	12	101	116	344	93	110	334	2,810
Laborers' families in United States (more comfortable circumstances)	2	120	147	534	110	140	518	3,925
Russian peasants	......	129	33	589	119	31	571	3,165
Swedish mechanics	6	134	79	523	123	75	507	3,330
PROFESSIONAL MEN								
Lawyers, teachers, etc., in United States	14	104	125	423	96	119	410	3,220
College clubs in United States	15	107	148	459	98	141	445	3,580
German physicians	2	131	95	327	121	90	317	2,680
Japanese professor	1	123	21	416	113	19	403	2,345
MEN WITH LITTLE OR NO EXERCISE								
Men (American) in respiration calorimeter	11	112	80	305	103	76	296	2,380
Men (German) in respiration apparatus	5	127	80	302	117	76	293	2,430
PERSONS IN DESTITUTE CIRCUMSTANCES								
Poor families in New York City	11	93	95	407	86	90	395	2,845
Laborers' families in Pittsburg, Pa.	2	80	95	308	74	90	299	2,400
German laborer's family	1	52	32	287	48	30	278	1,640
Italian mechanics	5	76	38	396	70	36	384	2,225
MISCELLANEOUS								
Negro families in Alabama and Virginia	39	86	145	440	79	138	427	3,395
Italian families in Chicago	4	103	111	391	95	105	379	2,965
French Canadians in Chicago	5	118	158	345	109	150	335	3,260
Bohemian families in Chicago	8	115	101	360	106	96	349	2,800
Inhabitants Java village, Columbian Exposition, 1893	1	66	19	254	61	18	246	1,450
Russian Jews in Chicago	10	137	103	418	126	98	405	3,135
Mexican families in New Mexico	4	94	71	613	86	67	595	3,460
Chinese dentist in California	1	115	113	289	106	107	280	2,620
Chinese laundryman in California	1	135	76	566	124	72	549	3,480
Chinese farm laborer in California	1	144	95	640	132	90	621	3,980
United States army ration, peace	......	120	161	454	110	153	440	3,730
German army ration, peace	......	114	39	480	105	37	466	2,725
DIETARY STANDARDS								
Man at hard work (Voit)	......	145	100	450	133	95	437	3,270
Man at moderate work (Voit)	......	118	56	500	109	53	485	2,965
Man with very hard muscular work (Atwater)	......	175	(*)	(*)	161	(*)	(*)	5,500
Man with hard muscular work (Atwater)	......	150	(*)	(*)	138	(*)	(*)	4,150
Man with moderately active muscular work (Atwater)	......	125	(*)	(*)	115	(*)	(*)	3,400
Man with light to moderate muscular work (Atwater)	......	112	(*)	(*)	103	(*)	(*)	3,050
Man at 'sedentary' or woman with moderately active work (Atwater)	......	100	(*)	(*)	92	(*)	(*)	2,700
Woman at light to moderate muscular work, or man without muscular exercise (Atwater)	......	90	(*)	(*)	83	(*)	(*)	2,450

* Fats and carbohydrates in sufficient amounts to furnish, together with the protein, the indicated amount of energy.

ferent nutrients furnished by them is calculated. Deducting from this the weights of the nutrients found in the kitchen and table refuse, the amounts actually consumed are obtained. Account is also taken of the meals eaten by different members of the family or groups studied and by visitors, if there are any. From the total food eaten by all the persons during the entire period the amount eaten per man per day may be calculated. In making these calculations due account is taken of the fact that women and children eat less than men performing the same amount of work. The various factors commonly used in the United States in computing the results of dietary studies are as follows:

FACTORS USED IN CALCULATING MEALS CONSUMED IN DIETARY STUDIES.

Man at hard muscular work requires 1.2 the food of a man at moderately active muscular work.

Man with light muscular work and boy 15-16 years old require 0.9 the food of a man at moderately active muscular work.

Man at sedentary occupation, woman at moderately active work, boy 13-14, and girl 15-16 years old require 0.8 the food of a man at moderately active muscular work.

Woman at light work, boy 12, and girl 13-14 years old require 0.7 the food of a man at moderately active muscular work.

Boy 10-11 and girl 10-12 years old require 0.6 the food of a man at moderately active muscular work.

Child 6-9 years old requires 0.5 the food of a man at moderately active muscular work.

Child 2-5 years old requires 0.4 the food of a man at moderately active muscular work.

Child under 2 years old requires 0.3 the food of a man at moderately active muscular work.

These factors are based in part upon experimental data, and in part upon arbitrary assumptions. They are subject to revision when experimental evidence shall warrant more definite conclusions.

The preceding table shows the average results of a large number of dietary studies made in the United States and other countries with persons performing different amounts of muscular work and living under different conditions. Using such factors as those referred to above, the digestible nutrients furnished by the diet have also been calculated.

As will be seen, the American dietary standards express the food requirements in terms of protein and energy only. This is done because of simplicity, and is permissible, since, theoretically at least, the proportion of fats and carbohydrates is immaterial, provided both are present and in such quantity that the total energy supplied is sufficient. As the habits and conditions of individuals differ, so, too, their needs for nourishment differ, and their food should be adapted to their particular requirements. Climate and other circumstances influence the character of the food consumed, and doubtless in large degree the quantity also. However, the amount of nutrients is determined, generally speaking, by the age, size of the body, and especially by the amount of work performed, increasing or decreasing according as the amount of work is greater or less. It is not necessary that the food each day equal exactly the amount called for by the dietary standards. A deficiency one day is made good by an excess the next, and *vice versa.* It is believed, however, that persons are best nourished when through long periods the diet furnishes approximately the nutrients and energy which the standard calls for. What has been said applies to persons in health and under more or less normal conditions; the diet of the sick, convalescent, etc., is a subject which pertains to the practice of medicine.

To learn whether any given diet conforms to the standard, the amount of nutrients and energy (or, what serves the same purpose, protein and energy) must be ascertained. To this end the weight of the different food materials provided for the day's diet must be ascertained, as well as the composition of each of the food materials. This may be readily calculated from the tables of percentage composition. The total protein and total energy is, of course, learned by adding together the amounts furnished by the different food materials. The amount per man per day can then be learned by dividing the total amounts by the number of persons served. If the diet be deficient in protein or in energy, food materials should be added which supply protein or are especially valuable as sources of energy (i.e. foods rich in fats and carbohydrates). If more protein or energy be provided than the standard demands, the food materials should be correspondingly diminished. In ordinary mixed diet, which seems to be the one best suited to man in health, the chief sources of protein are meat, fish, and milk, among animal foods, and the cereals and legumes among vegetable foods. Beans, peas, and oatmeal are rich in protein, and hence are especially valuable food. About nine-tenths of the fat in the ordinary diet is obtained from the animal foods, while the vegetable foods furnish approximately nine-tenths of the carbohydrates.

Too much food is as bad as too little, and occasions a waste of energy and strength in the body, as well as a waste of nutritive material.

Among people who have the benefits of modern comfort and culture the palate revolts against a very simple and unvaried diet, and for this reason the nutrients are usually supplied from a variety of articles—some of animal, some of vegetable origin. With a varied diet it is also easier to secure the proper proportions of protein to fats and carbohydrates.

PREPARATION OF FOOD—COOKING. The cooking of food has much to do with its nutritive value. Many articles which, owing to their physical condition or other cause, are quite unfit for nourishment when raw are very nutritious when cooked. It is also a matter of common experience that a well-cooked food is wholesome and appetizing, while the same material badly cooked is unpalatable. There are three chief purposes of cooking. The first is to change the physical condition so that the digestive juices can act upon the food more freely. Heating often changes the structure of food substances very materially, so that they are more easily chewed and more easily and thoroughly digested. The second is to make food more appetizing by improving the appearance, the flavor, or both. Food which is attractive to the taste quickens the flow of saliva and other digestive juices, and thus digestion is aided. The third is to kill by heat any disease germs, parasites, or other dangerous organisms food may contain. This is often a very important matter, and applies to both animal and vegetable foods. The cooking of meats not only develops the pleasing taste and odor of extractives and that due to the browned fat and tissues, but it softens and loosens the protein (gelatinoids) of the connective tissues, and thus makes the meat more tender. Extreme heat, however, tends to coagulate and harden the albuminoids of the lean portions, and also weakens the flavor of extractives. If the heating is carried too far, a burned or charred product of bad flavor results. Meats lose weight in cooking. A small part of this is due to escape of meat juices and fat, but the chief part of the material lost is simply water. The nutritive value of a meat soup depends upon the substances which are dissolved out of the meat, bones, and gristle by the water. In ordinary meat broth these consist almost wholly of extractives and salts, which are very agreeable and often most useful as stimulants, but have little or no value as actual nutriment, since they neither build tissue nor yield energy. The principles which underlie the cooking of fish are essentially the same as with meats. See FISH; FOOD VALUE.

In many vegetables the valuable carbohydrates, chiefly microscopic starch-grains, are contained in tiny cells with comparatively thick walls on which the digestive juices have little effect. The heat of cooking, especially with water, ruptures these walls and also makes the starch more soluble; without water it may also caramelize a portion of the carbohydrates and produce agreeable flavors in this and other ways.

In breads, cakes, pastry, and other foods prepared from flour, the aim is to make a palatable and lighter porous substance, more easily broken up in the alimentary canal than the raw materials could be. Sometimes this is accomplished simply by means of water and heat. The heat changes part of the water in the dough into steam, which, in trying to escape, forces the particles of dough apart. The protein (gluten) of the flour stiffens about the tiny bubbles thus formed, and the mass remains porous even after the steam has escaped. More often, however, other things are used to 'raise' the dough—such as yeast and baking-powder. The baking-powder gives off the gas carbon dioxide, and the yeast causes fermentation in the dough by which carbon dioxide is produced. This acts as the steam does, only much more powerfully. When beaten eggs are used, the albumen incloses air in bubbles, which expand, and the walls stiffen with the heat, and thus render the food porous.

PECUNIARY ECONOMY OF FOOD. Although the cost of food is the principal item in the living expenses of a large majority of the people, and although the physical welfare of all is so intimately connected with and dependent upon diet, very few of even the most intelligent have any ideas regarding the actual nutriment in the different food materials they use. In too many cases even those who wish and try to economize know very little as to the combinations which are best fitted for their nourishment, and have still less information as to the relation between the real nutritive value of different foods and their cost.

There are various ways of comparing food materials with respect to the relative cheapness or dearness of their nutritive ingredients. For instance, from the proportions of available nutrients and energy in different food materials given in Table III. we may calculate the cost of the different nutrients per pound, and of energy per 1000 calories in any given material for which the price per pound is known. Thus, for the different food materials given in Table V., when the price of any material is that given in the first column, the cost of protein and energy will be as given in the second and third columns. These figures show the relative economy of the various foods as sources of protein and sources of energy. Of course the amount of energy that would be obtained in a quantity of any given material sufficient to furnish a pound of protein would vary with the amounts of fats and carbohydrates accompanying the protein; and on the other hand, the quantities of the different materials that would furnish 1000 calories of energy would contain different amounts of protein. The figures for cost of protein leave the carbohydrates and fats out of account, and those for energy take no account of the protein. Hence the figures for either protein or energy alone give a very one-sided view of the relation between nutritive value and money cost. A better way of estimating the relative pecuniary economy of different food materials is found in a comparison of the quantities of both nutrients and energy which can be obtained for a given sum, say ten cents, at current prices. This also is illustrated in Table V., which follows.

While in the case of certain foods as purchased, notably meats, some waste is unavoidable, the pecuniary loss can be diminished, both by buying those kinds in which there is the least waste, and by utilizing, more carefully than is ordinarily done, portions of what is usually classed as refuse. Much of the waste may be avoided by careful planning so as to provide a comfortable and appetizing meal in sufficient amount, but without excess. If strict economy is necessary, the dearer cuts of meat and the more expensive fruits and vegetables should be avoided. With reasonable care in cooking and serving, a pleasing and varied diet can be furnished at moderate cost. It should not be forgotten that the real cheapness or dearness of a food material depends not only on its market price, but also on the cost of its digestible nutrients. It should always be remembered that "the ideal diet is that combination of foods which, while imposing the least burden on the body, supplies it with exactly sufficient material to meet its wants," and that any disregard of such a standard must inevitably prevent the best development of our powers.

HYGIENIC CONSIDERATIONS. Scrupulous neatness should always be observed in keeping, handling, and serving food. If ever cleanliness is desirable, it must be in the things we eat, and every care should be taken to insure it for the sake of health as well as of decency. Cleanliness in this connection means, not only absence of visible dirt, from worms and other parasites, but freedom also from undesirable bacteria and other minute organisms. If food, raw or cooked, be kept in dirty places, peddled from dirty carts, prepared in dirty rooms and in dirty dishes, or exposed to foul air, disease germs and other offensive and dangerous substances can easily get in. Food and drink may, in fact, be very dangerous purveyors of disease. Experiments have clearly shown that fruits, vegetables, and other foods may readily acquire undesirable or dangerous bacteria if exposed to street dust. The bacteria of typhoid fever sometimes find their way into drinking-water; those of typhoid and scarlet fevers and diphtheria into milk. Thus sickness and death are brought to large numbers of people. Oysters which are taken from the salt water where they grow, and 'floated' for a short time in brackish water near the mouth of a

TABLE V.—COMPARATIVE COST OF DIGESTIBLE NUTRIENTS AND ENERGY IN DIFFERENT FOOD MATERIALS AT AVERAGE PRICES

[It is estimated that a man at light to moderate muscular work requires about 0.23 pound of protein and 3050 calories of energy per day]

KIND OF FOOD MATERIAL	Price per pound	Cost of 1 pound protein *	Cost of 1000 calories energy *	Amounts for 10 cents				
				Total weight of food material	Protein	Fat	Carbo-hydrates	Energy
	Cents	*Dollars*	*Cents*	*Pounds*	*Pound*	*Pound*	*Pounds*	*Calories*
Beef, sirloin	25	1.60	25	0.40	0.06	0.06	......	410
Do	20	1.28	20	.50	.08	.08	......	515
Do	15	.96	15	.67	.10	.11	......	685
Beef, round	16	.87	18	.63	.11	.08	......	560
Do	14	.76	16	.71	.13	.09	......	630
Do	12	.65	13	.83	.15	.10	......	740
Beef, shoulder clod	12	.75	17	.83	.13	.08	......	595
Do	9	.57	13	1.11	.18	.10	......	795
Beef, stew meat	5	.35	7	2.00	.29	.23	......	1,530
Beef, dried, chipped	25	.98	32	.40	.10	.03	......	315
Mutton chops, loin	16	1.22	11	.63	.08	.17	......	890
Mutton, leg	20	1.37	22	.50	.07	.07	......	445
Do	16	1.10	18	.63	.09	.09	......	560
Roast pork, loin	12	.92	10	.83	.11	.19	......	1,035
Pork, smoked ham	22	1.60	13	.45	.06	.14	......	735
Do	18	1.30	11	.56	.08	.18	......	915
Pork, fat, salt	12	6.67	3	.83	.02	.68	......	2,950
Codfish, dressed, fresh	10	.93	46	1.00	.11	......	......	220
Halibut, fresh	18	1.22	38	.56	.08	.02	......	265
Cod, salt	7	.45	22	1.43	.22	.01	......	465
Mackerel, salt, dressed	10	.74	9	1.00	.13	.20	......	1,135
Salmon, canned	12	.57	13	.83	.18	.10	......	760
Oysters, solids, 50 cents per quart	25	4.30	111	.40	.02	......	.01	90
Oysters, solids, 35 cents per quart	18	3.10	80	.56	.03	.01	.02	125
Lobster, canned	18	1.02	46	.56	.10	.01	......	225
Butter	20	20.00	6	.50	.01	.40	......	1,705
Do	25	25.00	7	.40	......	.32	......	1,365
Do	30	30.00	9	.33	......	.27	......	1,125
Eggs, 36 cents per dozen	24	2.09	39	.42	.05	.04	......	260
Eggs, 24 cents per dozen	16	1.39	26	.63	.07	.06	......	385
Eggs, 12 cents per dozen	8	.70	13	1.25	.14	.11	......	770
Cheese	16	.64	8	.63	.16	.20	.02	1,185
Milk, 7 cents per quart	3½	1.09	11	2.85	.09	.11	.14	885
Milk, 6 cents per quart	3	.94	10	3.33	.11	.13	.17	1,030
Wheat flour	3	.31	2	3.33	.32	.03	2.45	5,440
Do	2½	.26	2	4.00	.39	.04	2.94	6,540
Corn meal, granular	2½	.32	2	4.00	.31	.07	2.96	6,540
Wheat breakfast food	7½	.73	4	1.33	.13	.02	.98	2,235
Oat breakfast food	7½	.53	4	1.33	.19	.09	.86	2,395
Oatmeal	4	.29	2	2.50	.34	.16	1.66	4,500
Rice	8	1.18	5	1.25	.08	......	.97	2,025
Wheat bread	6	.77	5	1.67	.13	.02	.87	2,000
Do	5	.64	4	2.00	.16	.02	1.04	2,400
Do	4	.51	3	2.50	.20	.03	1.30	3,000
Rye bread	5	.65	4	2.00	.15	.01	1.04	2,340
Beans, white, dried	5	.29	3	2.00	.35	.03	1.16	3,040
Cabbage	2½	2.08	22	4.00	.05	.01	.18	460
Celery	5	6.65	77	2.00	.02	......	.05	130
Corn, canned	10	4.21	23	1.00	.02	.01	.18	430
Potatoes, 90 cents per bushel	1½	1.00	5	6.67	.10	.01	.93	1,970
Potatoes, 60 cents per bushel	1	.67	3	10.00	.15	.01	1.40	2,950
Potatoes, 45 cents per bushel	¾	.50	3	13.33	.20	.01	1.87	3,935
Turnips	1	1.33	8	10.00	.08	.01	.54	1,200
Apples	1½	5.00	8	6.67	.02	.02	.65	1,270
Bananas	7	10.00	27	1.43	.01	.01	.18	370
Oranges	6	12.00	40	1.67	.01	......	.13	250
Strawberries	7	8.75	47	1.43	.01	.01	.09	215
Sugar	6	....	3	1.67	......	......	1.67	2,920

* The cost of one pound of protein means the cost of enough of the given material to furnish one pound of protein, without regard to the amounts of the other nutrients present. Likewise the cost of energy means the cost of enough material to furnish 1000 calories, without reference to the kinds and proportions of nutrients in which the energy is supplied. These estimates of the cost of protein and energy are thus incorrect in that neither gives credit for the value of the other.

stream, have been known to be affected by typhoid-fever germs brought into the stream by the sewage from houses where the dejections from patients had been thrown into the drains. Celery or lettuce has been thought to convey typhoid fever from having grown in soil containing typhoid germs.

Food materials may also contain parasites, like tapeworms in beef, pork, and mutton, and trichinæ in pork, which are often injurious and sometimes deadly in their effect. This danger is not confined to animal foods. Vegetables and fruits may be contaminated with eggs of numerous parasites from fertilizers used in growing them. Raw fruit and vegetables should always be very thoroughly washed before serving if there is any doubt as to their cleanliness. If the food is sufficiently heated in cooking, all organisms are killed. Sometimes food undergoes decomposition in which injurious chemical compounds, so-called ptomaines, are formed. Poisoning by cheese, ice-cream, preserved fish, canned meats, and the like has been caused in this way. The ptomaines often withstand the heat of cooking. In some cases it has been found that foods are adulterated with compounds injurious to health; but sophistication in which harmless articles of inferior cost or quality are added is more common.

Dainty ways of serving food have a usefulness beyond their æsthetic value. Every one knows that a feeble appetite is often tempted by a tastefully garnished dish, when the same material carelessly served would seem quite unpalatable. Furthermore, many cheap articles and 'left-overs,' when well seasoned and attractively served, may be just as appetizing as dearer ones, and will usually be found quite as nutritious.

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See articles on various materials used as food. See also INFANTS, FEEDING OF.

FOOD OF PLANTS. Carbonic acid and water are often spoken of as the food of green plants, but this is somewhat misleading; these substances are not themselves foods, but serve as material from which foods are made by the green cells of plants when sufficiently illuminated. (See PHOTOSYNTHESIS.) Various inorganic salts are sometimes reckoned among the foods. The rôle of these, however, is obscure at present, though some of the elements obtained from them, namely, potassium, magnesium, iron, and calcium, seem to be indispensable to the proper development and functions of the plant, and perhaps they are built into the protoplasm. At any rate the functions are profoundly altered when one element is replaced even by a similar element; e.g. potassium by sodium. Oxygen, too, has been included in the foods. But its relation to protoplasm in the process of respiration is uncertain, and for the present it is preferable to treat respiration and nutrition (q.v.) as distinct.

Excluding the substances mentioned, plant foods are complex carbon compounds, which belong mainly to four groups: carbohydrates, proteids, amides, and fats. They contain two or more of the elements carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus, combined in the most various proportions. The value of a food, however, does not depend on chemical composition alone, but is profoundly influenced by its constitution; i.e. the nature and arrangement of the atomic groups that make up its molecules. Apparently carbon is assimilable only when its atoms in the food molecules are directly combined with atoms of hydrogen. The introduction of a hydroxyl group (OH) seems to improve assimilability: thus glycerin, $CH_2OH.CHOH.CH_2OH$ is better than propyl alcohol, $CH_3CH_2CH_2OH$. The aldehyde group (CHO), too, is characteristic of many foods. Very little, however, is known of the chemical constitution of most foods. See RESPIRATION IN PLANTS; ABSORPTION; STORAGE; GROWTH.

FOOD, PRESERVATION OF. Bacterial growth and action is the cause of the decay of all food products, as it is of organic matter in general. Hence all processes for preserving food from decay have the same object in view—the prevention of the growth of these micro-organisms. These processes may be grouped in three general divisions: (1) The various methods which subject food to some process of treatment designed to prevent the growth of bacteria; (2) the canning process, which first, by the application of heat, kills all the bacteria in the food, and then, by hermetically sealing the sterilized food, prevents the access of more bacteria; (3) the use of cold, to keep the food at a temperature below that at which those micro-organisms can develop. It is an interesting fact that all these processes for preserving food, except the use of a few of the antiseptics, were successfully practiced long before the relation of micro-organisms to fermentation and putrefaction was even suspected, and that industries founded upon them were thriving while the scientists were still disputing whether putrefaction could be avoided by preventing the access of bacteria. See BACTERIA.

The first group of preserving methods embraces all the processes used in ancient times for keeping food except that of freezing, and also includes the modern use of antiseptics as such. It therefore includes desiccation, curing, pickling, and 'preserving,' in the more limited sense in which this term is used by housewives. *Desiccation* is probably the oldest, as it is the simplest method of preserving fruits, vegetables, and even meats from decay. As organic life requires moisture, the thorough drying of the food checks its growth. This was first done in the sun or by the fire. During the nineteenth century, however, more scientific principles were applied, and the preparation of prunes, raisins, and other dried fruits for the market has become an important industry in Spain, Italy, and, more recently, in southern California.

The first patented process for the modern method of drying fruits and vegetables by evaporation was introduced by Chollet of Paris in 1852, and patented in England in 1854. It was chiefly applied to vegetables and a few kinds of fruit, such as apples and pears, which have a small amount of juice. By this method Chollet entirely removed all moisture from the vegetables by drying either in a vacuum or by the aid of heated air, which reduces their bulk more than one-half. They are then compressed under powerful presses, which, besides rendering them extremely portable, also makes them less liable to absorb moisture from the atmosphere, which is very desirable, as they are very absorbent. In this way both the color and distinctive flavor of the vegetables are completely preserved, and mere soaking in water restores them almost precisely to their original condition. See RAISINS; PRUNES.

In the case of large pieces of meat, like hams, the mere process of drying is supplemented by the use of salt and by smoking over a wood fire, the chief preservative element in the smoke being creosote. This general process of preserving meat, subject to endless variations, is known as *curing.* This method has long been known to Oriental as well as Western nations, and it is still a very popular method of preserving meat. In the United States the large packing houses smoke immense quantities of meat with hickory wood. One establishment in Chicago has 43 smoke-houses, each of which holds 600,000 pounds of ham, or 120,000 pounds of side meat, besides 11 houses of half that capacity. (See HAM.) Certain fish and meats are cured by simply packing in salt or in a strong brine, salt being an excellent antiseptic or germ-killer.

PRESERVING AND PICKLING are the processes by which food, usually fruits, is preserved by the use of sugar, vinegar, or some alcoholic liquor, as brandy, or by a combination of sugar with brandy or vinegar, heat being applied. Fruits intended for confectionery are preserved in four different ways: They may be preserved in the form of jam, in which the fruit is simply boiled with from one-half to equal its weight of sugar. By this method the fruit becomes broken, and the juice set free; but all is preserved, as the latter forms a thick syrup with sugar. Such preserves can be kept, if well made, for several years, but are best used during the first winter. A second plan is to preserve only the juice, which, when carefully strained from the solid portions of the fruit, and boiled with a third or half its weight of refined sugar, constitutes the fruit jellies of the cooks and confectioners. Another method is called candying, and consists in taking fruits whole or in pieces, and boiling them in a clear syrup previously prepared. In this way they absorb the syrup, and are then dried by a gentle heat, which causes the sugar of the syrup to crystallize on the surface and through the substance of the preserved fruits, which retain their form, and much if not all of their color. The remaining method is to stew them carefully in a weak syrup of refined sugar and water, so that they are rendered soft but are not broken. They are then transferred, with the syrup, to jars with well-prepared covers, to prevent evaporation; and pale brandy, equal in quantity to the syrup, is added. As a rule only stone-fruits, such as peaches, plums, and cherries, are preserved in this way. Several fruits and vegetables, such as olives, cucumbers, cabbage, etc., are preserved for food in a saturated solution of salt and water poured in hot; others, in vinegar.

FOOD PRESERVATIVES. The use of antiseptics for the preservation of food is a recent and rapidly growing practice which is liable to great abuse, and against which it is believed that strict sanitary regulations should be enforced. The scientific side of the subject has been discussed under ANTISEPTIC.

Of the 67 samples of commercial food preservatives examined by W. D. Bigelow, of the Division of Chemistry in the United States Department of Agriculture, 33 contained borax or boric acid; 10 sodium, potassium, or calcium sulphite; 8 salicylic acid or its sodium compound; 1 boric acid and salicylic acid; 1 boric acid and ammonium fluoride; 3 formaldehyde; 7 common ammonium fluoride; 2 pyroligneous acid; and 1 beta-naphthol. Certain of these substances are undoubtedly injurious, such as formaldehyde, salicylic acid, and sulphites, and in the case of others, like borax and benzoic acid, the toxic action is disputed. Passing on to the consideration of the effect of each of these different drugs on the system, it is shown that a pound of meat treated according to directions with *borax* would contain four or five more grains than a physician's dose, and that an infant who is fed a quart of milk each day so treated will receive eight grains, a fair-sized dose for an adult.

The use of *sulphites* is less common in food preservatives, but far more dangerous. In the preparation of casks for storing wine it has long been customary to treat them with a small amount of burning sulphur. The sulphurous acid so formed assists in sterilizing the casks and preventing the after-fermentation of the wine. In all wine-producing countries except America the amount of sulphurous acid so employed is limited by law to one or two parts in 10,000 parts of wine. Free sulphurous acid and sulphites are permitted in European wines in only one-tenth the amount given above. The compound is recognized as distinctly toxic, and a larger proportion than that mentioned is universally recognized as injurious. The sale of beer containing sulphurous acid or sulphite is specifically prohibited in almost all civilized countries. By following the directions of dealers in food preservatives we would add one to four ounces or its equivalent of this substance to 100 pounds of meat, or the same amount to from 35 to 50 gallons of cider, beer, or other liquid. *Salicylic acid* (q.v.) is chiefly used in the United States to preserve fruit and vegetable products. Many European countries prohibit its use as a food preservative altogether, and its use is condemned by the result of all recent physiological studies. It is possible that the majority of persons in sound health may suffer no evident injury from its use in small amounts, but its use by aged and infirm persons is attended with great danger. The use of *benzoic acid* as a food preservative is widespread and rapidly increasing, having been substituted by many manufacturers for the more harmful salicylic acid. Mr. Bigelow concludes that there are doubts as to the wholesomeness of this compound, and contends that food containing it should always be so labeled. *Formaldehyde* has been used as a preservative since 1895, and is most commonly employed for the preservation of milk. Its use is undoubtedly objectionable, and should be prohibited. Not only does it interfere with digestion to a marked extent, but it has been definitely proved that a compound is formed with the casein of milk, which causes the latter, when treated with dilute acid, such as exists in the gastric juice, to separate in hard lumps that are attacked with difficulty by the digestive ferments. Aside from the actual danger of its use, there is always the likelihood that its action will be depended upon to keep milk sweet, to the neglect of the cleanliness which should characterize the handling of this most easily contaminated food material. The *fluorides* and *beta-naphthol* are condemned unqualifiedly, there being no doubt of their toxic properties. Various attempts have been made to use *pyroligneous acid* for the curing of meats in place of the more tedious process of smoking. The trade name for this compound is 'liquid smoke.' Its effects, from a hygienic standpoint, have not been ascertained, but it is certain that meat treated with a bath in pyroligneous acid should not be sold as smoked meat.

An attempt has been made to prevent meat from putrefying by introducing an antiseptic liquid into the circulation of the animal before being killed. The bullock is first stunned by a blow, the jugular vein is then opened, and a small quantity of blood drawn. A tube is afterwards inserted, through which the antiseptic mixture is forced into the circulation, and after a few minutes the animal is killed. Meat treated in this way keeps fresh for several weeks.

Canning. The process of hermetically sealing food to preserve it for future use was discovered in 1795 by a Frenchman named Nicholas Appert. Fourteen years later Napoleon gave him a prize of 12,000 francs for his invention. He continued his researches through life, spending all his money upon them, and, like many other inventors, died alone, in poverty and neglect. In 1810 an English patent was taken out for Appert's process, from which, however, the latter derived no benefit. From England the knowledge of the process was soon brought to America. Lobsters and salmon were the first goods canned in America, but by 1825 fruits and vegetables were also canned. In 1849 a factory was established at Newark, N. J., where fruits and vegetables were canned for Dr. Kane's Arctic expedition. The discovery of gold in California the same year gave a great impetus to the canning industry.

During the Civil War canned condensed milk, the process of making which had been patented by Gail Borden in 1856, was in great demand.

Glass jars were at first used, but their use was soon abandoned on account of their perishability, bulkiness, and expensiveness, and in 1823 Thomas Kensett secured a patent on the use of tin cans for this purpose, and this material has since been universally employed. At first the cans were cut out with shears, beaten together over a former, and soldered by hand. The cans were crude, and their manufacture very expensive. In 1847 Allen Taylor invented the stamp can, and two years later Henry Evans invented a press for stamping out can-tops. The key-opening can, which was perfected by Zimmerman, is a much more recent invention.

By the Appert process the goods were cooked in open kettles, in which, of course, the highest obtainable temperature was 212 degrees. By adding chloride of calcium to the water the temperature could be raised to 240 degrees. About 1874 John Fisher invented a patent process kettle in which the goods are heated to any desired temperature with dry steam; at about the same time A. K. Shriver invented a closed-process kettle in which the goods are cooked by superheating water with steam. Both of these methods are now in use. In the modern canning factory the goods are immediately sorted and placed in the cans, and the caps soldered on. In each cap there is a hole for the escape of gas and steam during the cooking process. The cans are then placed in a steel boiler, the cover of which is bolted down, and steam turned in, which sterilizes the contents by heating to the proper temperature under pressure. They are then hermetically sealed by placing a drop of solder on each vent-hole, and are ready for shipment. Not only raw foods, but a large variety of made dishes, as soups, sauces, and jams, are put up in this way.

The canning of fish requires greater care than that of fruit and vegetables because fish decay so much more rapidly. It is said that long before the Appert process was invented the people of Holland had learned the art of canning salmon, so as to arrest putrefaction. The fish were boiled in a salt brine, then smoked, and then sealed in tin cans liberally supplied with butter. The salmon canneries of the Pacific are usually located on the water's edge. The fish immediately upon receipt are subjected to an ice-cold bath, and after being dressed are again washed. They are cut up by machinery into pieces the length of the can, and are then subjected to such intense heat that not only the fish but the bones are cooked so that they will crumble. The cans are tightly soldered for the first cooking. They are then tested by the process known as 'blowing' or 'venting,' which consists in making a small perforation in each can to permit the escape of steam. The can is then placed in another steam-heated retort for the final cooking, after which it is given a lye bath to remove grease. After cooling the cans are lacquered and labeled, ready for market.

The canning of oysters has been encouraged by various improvements. At first the oyster-shells were opened by hand. In 1858 Louis McMurray began scalding the oysters before they were shelled, a treatment which greatly facilitated the latter operation. In 1862 steam was used instead of hot water. This was at the suggestion of Henry Evans, who devised a steam-chest holding about twenty bushels of oysters. A door is at each end of the air-tight chest and through it runs a track on which the carload of oysters is pushed in. After steaming fifteen minutes the oysters are easily shelled with a knife by skilled operatives. They are then canned in the usual manner.

The objection has been urged against the use of tin cans that the natural acids of fruits, vegetables, and meats act upon the tin and solder in such a way as to form metallic salts or metallic compounds that are injurious to health. According to a statement in a section on the canning and preserving of foods in the United States Census for 1900, the matter has been carefully investigated by expert chemists, who have reported that if good tin is used the objection is groundless. In the poorer grades of tin injurious substances were found, but in such small quantities that they were of no consequence.

Statistics of the Canning Industry. According to the census report just mentioned, 2195 establishments in the United States were engaged in 1900 in the canning of fruits and vegetables, fish and oysters. The total capital invested in this industry was given as $48,497,978, and the annual value of the products as $82,592,196. The industry is divided into three distinct branches, the canning of fruits and vegetables being handled by one group of establishments, the canning of fish by another, and the canning of oysters by another. Of the 2195 canning factories, 1808 belong to the first-named class, 348 to the second, and only 39 are reported as engaged in canning oysters. The canning of fruits and vegetables is well distributed over the country, but the largest number in any one State, 136, is in California. In canning fish Maine leads with 117 establishments and Alaska comes next with 36. The most important branch of the industry is the salmon-canning of the Pacific Coast, next to which comes the sardine-canning of Maine. Oysters are canned on the shores of the Chesapeake and of the Gulf of Mexico. Considering the growth of the industry as a whole, we find that fruit and vegetable canning factories have increased from 97 in 1870 to 1808 in 1900; fish-canning factories have increased from 110 in 1890 to 348 in 1900. The value of canned goods imported into the United States in 1900 was $8,023,763, and of exports for the same year, $19,557,857.

COLD STORAGE. The use of artificial cold for the preservation of perishable foods, either in storage or transit, was introduced during the last quarter of the nineteenth century, and has effected a complete revolution in the method of handling food, particularly meat. The method by which the temperature is lowered for cold storage is described under REFRIGERATION. Some of the practical results of cold storage are discussed under PACKING INDUSTRY.

BIBLIOGRAPHY. For descriptive and statistical matter regarding the canning industry, consult Hunt, "Canning and Preserving," in *Twelfth United States Census*, Manufactures, vol. ix., part iii. (Washington, 1902); for discussions on "The Use and Abuse of Food Preservatives" and on "The Influence of Refrigeration on the Fruit Industry," consult the *Year Book of the Department of Agriculture* for 1900 (Washington, 1901).

FOOL. See COURT FOOL.

FOOL OF QUALITY, THE. A quasi-historical religious novel, by Henry Brooke (1760-70). It was revised and republished by Wesley during the author's lifetime without the author's consent, under the title of *The History of Harry, Earl of Moreland*, and was again republished in 1859 by Charles Kingsley with a biographical memoir. The story was suggested by a tale told the author by his uncle during a horseback journey, and was one of the most remarkable books of its time.

FOOLS, FEAST OF. See FEAST OF FOOLS.

FOOL'S ERRAND, A. A novel of the South in the Reconstruction period, by Albion W. Tourgée (1879). The career of the hero, Comfort Servosse, shows vividly the difficulties of Northerners living in the South at that time.

FOOL'S PARADISE (Lat. *limbus fatuorum*). That division of *limbus* (q.v.) in which the souls of fools, idiots, and lunatics, who are not responsible for their sins, nor yet deserving of heaven, await the Resurrection. As commonly used, the expression denotes a state of insecure joys, false hopes, and sometimes of unlawful love.

FOOL'S PARSLEY. An umbelliferous weed, very common in gardens and fields of Europe, and introduced into the United States from New England to Minnesota. The only species, *Æthusa Cynapium*, is a poisonous plant with properties similar to those of the hemlock, and resembles parsley in its manner of growth and foliage. It is frequently mistaken for parsley, and is the cause of serious accidents.

FOOL'S REVENGE, THE. A tragedy by Tom Taylor, produced at the Queen's Theatre, London, in 1869. It was taken bodily from Hugo's *Le roi s'amuse*.

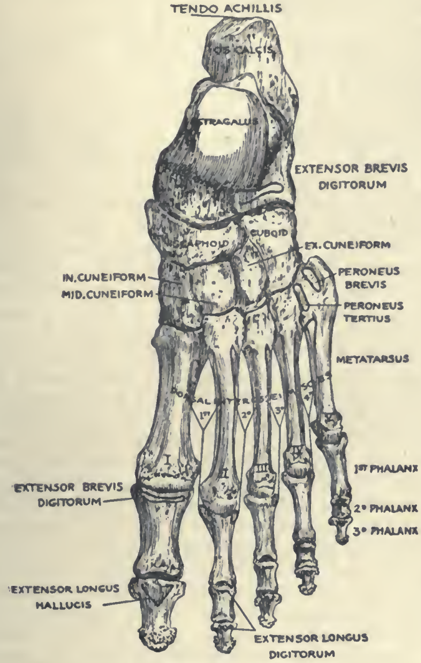
FOOT. See WEIGHTS AND MEASURES.

FOOT (AS. *fōt*, Icel. *fōtr*, Goth. *fōtus*, OHG. *fuoz*, Ger. *Fuss*, foot; connected with Lat. *pes*, Gk. πούς, *pous*, Lith. *padas*, Av. *pāδa*, Skt. *pada*, foot). In music, a unit of measure used in determining the pitch of organ-stops. The Germans have always used the word *fusston* in representing the pitch of the different stops of an organ, such as *Principal* sixteen-foot, eight-foot, or four-foot, etc., a practice which has been universally introduced, and is found very useful to organists. The pitch of the stop is fixed according to the length of the lowest C pipe. Thus an eight-foot stop is one whose longest pipe produces the tone C; a four-foot stop is an octave stop; and a sixteen-foot stop gives tones an octave lower than the notes indicated by the keys used. See ORGAN.

FOOT (in verse). See METRE.

FOOT. In describing the structure of the foot, it is expedient to commence with a brief notice of the bones which occur in it. In man these are 26 in number, and are arranged in three natural groups—viz., the tarsal bones, corresponding to the carpal bones of the hand, which are the hindermost; the metatarsal bones, which occupy the middle portion; and the phalanges of the toes anteriorly. The tarsal bones, seven in number, are short and thick, and form the heel and the hinder part of the instep. The uppermost is called the *astragalus*, from its supposed resemblance to the dice used by the Romans. Above it is articulated or jointed with the two bones of the leg, the *tibia* and *fibula*, and through these bones the whole weight of the body is thrown upon the two *astragali*. Behind, it is connected with and rests upon the *os calcis*, or heel-bone, which is the largest bone of the foot. Immediately in front of it, and supporting it in this direction, is the *scaphoid* or boat-like bone. In front of the scaphoid bone are the three *cuneiform* or wedge bones; and on the outer side of the cuneiform bones, and in front of the os calcis, is the *cuboid* bone. The front row of tarsal bones is composed of the three cuneiform bones on the inner side of the foot, and of the cuboid bone externally. There are five metatarsal bones passing forward, one for each toe. Each cuneiform bone is connected with one, and the cuboid bone with two, of these metatarsal bones. Behind, they are close together, but as they run forward they diverge slightly from one another, and their anterior ends rest upon the ground, and form the *balls* of the toes. They constitute the fore part of the instep. The remaining bones are those of the toes, and are named the *phalanges*, each toe having three of these bones, excepting the great toe, which has only two.

The instep is composed of the seven tarsal and the five metatarsal bones, which are so arranged and connected as to form an arch from the extremity of the heel-bone to the balls of the toes. This is called the plantar arch, from *planta*, the sole of the foot. The astragalus forms the summit or keystone of this arch, and transmits the weight which it receives posteriorly to the heel, and anteriorly to the balls of the toes. The arrangement of the fibres and laminæ in the interior of the bones is such that the greater number of them in each bone follow the directions of the two pillars of the arch, and thus give the greatest strength to the bones in the directions in which it is most required. There is also an arch from side to side in the foot, springing from the cuboid on the outside to the inner cuneiform on the inside. See Foot, Comparative Anatomy of.



DORSAL SURFACE OF LEFT FOOT.

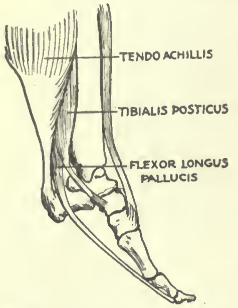
The bones, where they articulate with one another, are covered with a tolerably thick layer of highly elastic cartilage, and by this means, together with the very slight movements of which each bone is capable, a degree of elasticity is given to the foot, and consequently to the step, which would be altogether wanting if the plantar arch were composed of one single mass of bone. This elasticity is far greater in the anterior pillar of the arch, which is composed of five comparatively long bones sloping gradually to the ground, than in the posterior pillar, which is short, narrow, and composed of a single bone, which descends almost vertically from the ankle to the ground. Hence, in jumping from a height we always endeavor to alight upon the balls of the toes and thus break the shock which we should feel if, by accident, we descended upon the heels.

The ligaments which unite these bones to one another, and by which the movements of each bone upon the others are limited, are very numerous. We shall merely notice two of these ligaments, selecting those whose action is especially obvious in maintaining the shape of the plantar arch. One, the *plantar*, or *long calcaneo-cuboid ligament*, of great strength, passes from the under surface of the *os calcis*, near its extremity, forward to the bases of the second, third, and fourth metatarsal bones. It extends between the lowest points of the two pillars of the arch, holding them in their places, and preventing their being thrust asunder when pressure is made upon the key-bone. It converts the groove on the under surface of the cuboid bone into a canal for the passage of the tendon of the *peroneus longus* muscle. Another very strong ligament passes from the under and fore part of the os calcis to the outer side of the scaphoid bone. This is the *superior calcaneo-scaphoid* ligament. The *interosseus*, or *internal calcaneo-cuboid* ligament, directly connects the os calcis and the cuboid bones. It is blended at its origin with the *superior calcaneo-scaphoid ligament;* and by separating in front they present such an appearance as to be called the Y ligament. The Y ligament underlies and supports the round head of the astragalus, and has to bear a great deal of the weight which is transmitted to that bone from the leg. It possesses a quality which the ligament just described, and most ligaments, have not—viz., elasticity. This is very important, for it allows the head of the key-bone to descend a little when pressure is made upon it, and forces it up again when the pressure is removed, and so gives very material assistance to the other provisions for preventing jars, and for giving ease and elasticity to the step.

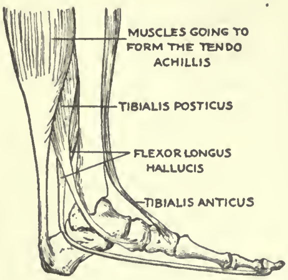
The spot over which this ligament extends is the weakest in the foot, the astragalus being there unsupported by any bones; additional support is, however, afforded when it is most required by the tendon of a strong muscle, the *posterior tibial*, which passes from the back of the tibia (the chief bone of the leg) round the inner ankle, to be inserted into the lower part of the inner surface of the scaphoid bone. It not infrequently happens that the astragalus, from either being insufficiently supported or being overweighted, descends slightly below its proper level, causing a lowering of the arch and a flattening of the sole of the foot. The defect, when slight, is known as 'weak ankle;' when more decided it is termed 'flat-foot;' and in extreme cases the bone may descend to such an extent as even to render the inner side of the foot convex when it naturally should be concave. There are two periods of life at which *flat-foot* is especially liable to occur: (1) In infancy, if the child be put upon its feet before the bones and ligaments—especially the latter—are strong enough to bear its weight; and (2) about the age of 14—a period at which growth is very quick, and the body consequently attains a considerable and rapid augmentation of weight.

We now come to the movements of the foot upon the leg. We see here a striking combination of variety of movement with general security. This combination is effected by the harmonious action of three joints, each of which acts in a direction different from the others. The first of these joints is the ankle-joint, which is formed by the bones of the leg—the tibia and fibula—above and the astragalus below. By this joint the foot is bent or straightened on the leg. The second joint is between the astragalus and the heel-bone, and it permits the foot to be rolled inward or outward; while the third joint is between the first and second row of tarsal bones—namely, between the astragalus and heel-bone behind, and the scaphoid and cuboid bones in front—and allows the degree of curvature of the plantar arch to be increased or diminished within certain limits. The following is the order in which the movements of these three joints occur: the raising of the *heel* (by the first joint) is accompanied by a rolling of the foot inward (by the second joint), and by an increased *flexure* of the plantar arch (by the third joint); and the raising of the *toes* is accompanied by a rolling of the foot outward and a *straightening* of the sole.

The joints, however, merely allow of movements—they do not effect them; this is the special function of the muscles, and each of the three movements we have indicated is effected by special groups of muscles. The first series of movements is mainly effected by three muscles, viz.: (1) *the muscles of the calf*, attached above to the bones of the thigh and leg, and below by the *tendo Achillis* to the heel-bone; (2) the *posterior tibial*, attached above to the tibia, and below by its tendon to the scaphoid bone; and (3) the *peroneus brevis*, attached above to the fibula, and below by its tendon to the outer metatarsal bone. The calf-muscles, whose tendon is inserted into the heel-bone, are large and very powerful, for in raising the heel they have to raise the weight of the body. The other two muscles, the posterior tibial and the short peroneal, turn round the inner and outer ankle respectively, and are inserted into the inner and the outer edges of the instep—the former being attached to the scaphoid, and the latter to the outer metatarsal bone. They not only assist to raise the ankle, but support it laterally. The muscle whose tendon is on the inner side of the foot (the posterior tibial) effects the two movements which are associated with the raising of the heel-bone, namely, the turning of the foot inward and the increased flexure of the arch. The second series of movements—the raising of the toes, the turning of the foot outward, and the straightening of the sole—are effected by two muscles, the *anterior tibial* and the *third peroneus*, whose tendons pass, one in front of the inner ankle, and the other in front of the outer ankle, to the corresponding edges of the instep, and are inserted into the internal cuneiform and the outer metatarsal bones. The muscles are direct flexors of the tarsus upon the leg, the former raising the inner and the latter the outer border of the foot.



EFFECT OF MUSCULAR ACTION IN THROWING UP THE ARCH.



ARCH OF THE FOOT IN ORDINARY STANDING POSITION.

Another point in the anatomy of the foot that requires notice is the mode of union of the metatarsal with the tarsal bones. In these joints in the fourth and fifth toes a slight revolving motion can take place, which probably enables the outer metatarsals to adapt themselves to inequalities of the ground, and to equalize the distribution of the weight which is thrown upon the foot; while in the corresponding joints of the three inner toes scarcely any motion can occur—a provision by which additional strength is given to the inner side of the foot, upon which the weight of the body most directly falls.

The skin of the sole is very tough and strong; and intervening between it and the bones and long plantar ligament is a thick pad of fat, which acts the part of an air or water cushion in defending the adjacent parts from injurious pressure, and in deadening the jars and shocks that would otherwise be felt in leaping, etc.

Consult: Humphry, *The Human Foot and the Human Hand* (London, 1861); Owen, *On the Anatomy of Vertebrates* (London, 1866); Morris, *Treatise on Anatomy* (London, 1902).

FOOT, COMPARATIVE ANATOMY OF THE. As locomotor appendages, so called, feet occur in echinoderms, mollusks, and arthropods among vertebrates, but they are not in any way homologous with the feet of the higher vertebrates. Among echinoderms the name 'foot' is given to any appendage of the ambulacral system which terminates in a sucker, and in the case of starfishes it is extended to any of the appendages lying in the ambulacral groove. These echinoderm feet are often, but by no means always, used for locomotion. Mollusks possess a very muscular and usually largely developed organ, primarily concerned with locomotion, known as the foot; it is flat or concave in the chitons and gastropods, and covers the ventral side of the body; in lamellibranchs it is also ventral in position, but is wedge-shaped and laterally compressed; in cephalopods it is anterior in position, surrounding the mouth, and is divided up into a siphon, placed posteriorly, and a number of outgrowths known as tentacles or arms. Among cephalopods the chief function of the arms is for capturing prey, locomotion being provided for in other ways, chiefly by means of the siphon, which is formed by the union of two epipodial folds. The 'feet' of arthropods show a very great variety of form, due chiefly to the variety of functions which they perform. In most cases it is practically impossible to distinguish between leg and foot, the latter consisting merely of the terminal joint or joints of the former. In many insects, however, the terminal part of the leg is so placed, with reference to the other joints, when in use, that it has both the appearance and function of a foot.

AMPHIBIANS AND REPTILES. Passing over the non-homologous fins of fishes, we may first mention the foot of the Urodela, the short-legged amphibians. As in all vertebrates, the feet here are the termination of the hind limbs, and their skeleton consists of two or three parts, according to whether we include the ankle-bones or not. Most distal of all are the phalanges of the digits or toes, then follow the metatarsals, and most proximal are the tarsals. In the Urodela, the feet are supplied with five digits in most cases, but some have only four, and Proteus has only two; the digits lack nails or claws; the number of phalanges differs in the various digits as well as in various species. The metatarsals are of the same number as the toes and appear like their proximal joint. The tarsals are a group of nine bones, of which one, the centrale, occupies a middle position; distal to it are five others of approximately uniform size, called tarsales; proximal to the centrale are three bones, of which the inner is the tibiale, the outer the fibulare, and the middle one the intermedium. In the Anura (frogs, toads, etc.) the foot is very much larger, and the toes, five with no nails, are broadly webbed; phalanges and metatarsals are greatly elongated, as are also two of the tarsal bones, which are known as the astragalus and the calcaneum; the former is the tibiale, with which the intermedium has fused, while the latter is the fibulare. The Chelonia (turtles, etc.) have five digits, but in the marine forms the toes are more or less firmly united together by the integument, thus forming paddles useful in swimming. Some or all of the digits of Chelonia bear nails or claws. The phalanges and metatarsals are stout and short, except in the marine forms, where they are elongated and flattened. The fifth metatarsal has the appearance of being bent in the middle. The tarsal bones undergo various fusions, so that their number and arrangement differ in different genera. The tibiale and intermedium are generally united into an astragalus, which in some cases includes the centrale also, and in one genus (Emys) even the fibulare, thus making a single bone of the whole proximal series. The two outer tarsals are fused to form the cuboid. Lizards usually have five digits, two, three, four, five, with four phalanges respectively, beginning at the inner side; the fifth metatarsal is bent as in the turtles, and is perhaps fused with the fifth tarsale, in which case the ankle-joint would come in part between the two rows of tarsal bones, which is the condition of the ankle in birds. In lizards we find an astragalus and calcaneum proximally and a cuboid distally, with sometimes one or two more of the tarsales. Feet are entirely lacking in snakes, unless the spur on each side of the body near the vent in the boas and pythons be regarded as such. Crocodiles have only four toes, though an examination of the skeleton reveals a rudimentary fifth metatarsal; the four digits have respectively two, three, four, and four phalanges, and only the first three have claws. Only four tarsal bones are present, of which the two distal ones are small, while the two proximal, called astragalus and calcaneum, are large; the latter bears a prominent calcaneal process projecting posteriorly, which forms a heel to the foot—the first occurrence of such a thing in the animal kingdom.

Birds. Among birds the feet are so profoundly modified by the various uses to which they are put that we find a very great variety of external form, but the skeletal structure shows considerable uniformity. The number of digits is usually four, not rarely three, and in the ostrich only two; the fifth toe is the one always missing, the first occasionally, and in the ostrich the second also; the phalanges are almost always two, three, four, and five, or rarely, two, three, four, and three, or in swifts, two three, three, and three. The metatarsals are more or less completely fused into a single bone, the upper end of which is fully fused with the distal row of tarsal bones. The proximal tarsal bones are fused with the lower end of the tibia, so that the ankle-joint is actually between the two series of tarsal bones. In the foot of a bird, therefore, what is usually termed the 'heel' is simply the base of the digits; the so-called 'tarsus' (see Bird) is really a tarso-metatarsus, and the 'tibia' is a tibio-tarsus. The foot of a bird is usually free from feathers, and is generally covered with scales, and the digits terminate in straight or more or less hooked claws. In some birds, however, especially among the grouse and the birds of prey, the feet are feathered (at least in front) to the base of the toes, and in ptarmigans even to the claws.

Mammals. Among mammals there is perhaps even greater variety in the form and structure of the foot than among birds, but the foot of mammals is usually very similar to the hand, except in the highest forms. In the orders Sirenia and Cetacea there is no foot whatever, and among the aquatic Carnivora (seals, etc.) it is modified to form a sort of flipper of great use in swimming; this is accomplished by the lengthening of the first and fifth digits, the great reduction of the heel, and the greater or less union of the leg with the tail and posterior part of the body. The number of functional digits in mammals varies from one to five, but frequently, where the number is below five, rudimentary digits are present. The digits terminate either in claws, nails, or hoofs, according to the habits of the animal; the number of phalanges is remarkably constant—in the first digit two, and three in each of the remaining four. In the Ungulata the metatarsals are often fused to form a long tubular bone, the 'cannon-bone.' The tarsus of mammals contains from six to eight bones, according to the amount of fusion; the intermedium is distinct only in marsupials, in the Monodelphia being fused with the tibiale to form the astragalus; the fourth and fifth tarsales fuse into a single bone known as the cuboid; the centrale is called the navicular, and the calcaneum is called the pisiform bone; the other tarsales are known as cuneiform bones, and the inner and second one sometimes fuse to form a single bone. Lack of space forbids any discussion of the general appearance of the feet and their special uses in mammals, but it may be remarked that if the whole sole of the foot is applied to the ground the animal is called 'plantigrade,' like man; if only the toes form the supporting portion of the foot, the animal is 'digitigrade'; and if only the distal phalanx serves for support (as in the horse) the creature is 'unguligrade.'

Consult: Wiedersheim, *Comparative Anatomy of Vertebrates* (New York, 1886); Huxley, *Anatomy of Vertebrated Animals* (New York, 1886); Baur, "On the Morphology of the Tarsus in Mammals," in *The American Naturalist*, vol. xix. (Philadelphia, 1883).

FOOT, Solomon (1802-66). An American lawyer and legislator. He was born in Cornwall, Vt., graduated at Middlebury College in 1826, and was professor of natural philosophy in the Vermont Academy of Medicine from 1828 to 1831, when he was admitted to the bar. After serving for several terms in the State Legislature, for three years (1836, 1838 and 1847) as speaker of the House, he was one of the Representatives of his State in Congress from 1843 to 1847, and from 1851 until his death was a member of the United States Senate, serving as president *pro tempore* during a part of the Thirty-sixth and the whole of the Thirty-seventh Congress. At first a Whig, he joined the Republican Party at the time of its formation in 1856.

FOOTA-JALLON, fo͞o'tȧ'zhȧ'lôɴ'. See Futa-Jallon.

FOOT-AND-MOUTH DISEASE, or Aphthous Fever. A virulent infectious disease, characterized clinically by a condition of fever followed by eruptions on the integument especially of the mouth and feet. Since the middle of the eighteenth century outbreaks of an epizoötic form have been frequently recorded among cattle, which, like pigs, are especially subject to it. It also occurs in sheep, goats, and other even-toed ungulates. Man is frequently affected. In European countries, where the disease usually prevails and causes great losses, the outbreaks have usually spread from Asia. Africa has also been visited.

The disease may appear under a mild or a grave form. In the mild form symptoms of fever and general lassitude are observed. Bladder-like eruptions appear, especially on the mucous membrane of the mouth, between the hoofs, and on the mammary gland. The last-named location is most frequently attacked during the secretory condition of the gland. Mammitis is a frequent complication of the disease. The mortality from this form of the disease in cattle is usually from two to fifty for each one thousand cases. In the grave form of the disease eruptions occur on internal mucous surfaces of the digestive or respiratory tracts. The symptoms in such cases are those of acute bronchitis, pneumonia, or enteritis, according to the part which is affected. The mortality in this form varies from 15 to 20 per cent. In sheep the eruptions on the feet are usually more serious and persist for a longer time. In sucking lambs the disease assumes the intestinal form, and is especially fatal. The disease spreads rapidly among animals confined in the same stable. Infection may be produced by the eruptions on the feet. Infected water is another common means of dissemination. The virus of the disease may gain entrance to the organism through the uninjured mucous membranes of the mouth, respiratory passages, or the alimentary tract. The pathogenic organism of this disease has never been isolated. The period of incubation after infection by natural methods is from two to six days. The virus is readily destroyed by desiccation or by exposure to air and sunlight. It possesses a weak resisting power to antiseptics such as carbolic acid and formaldehyde. Inoculation with serum from animals which have recovered from the disease does not confer immunity. Loeffler and Frosch succeeded in producing immunity to the disease by intravenous injections of lymph from aphthous subjects, but the results were not constant. No medicament has been found to have a specific action on the development of the disease. The mucous surfaces upon which eruptions occur may be washed with antiseptic solutions, and other symptoms may be combated as they appear. The chief reliance should be placed on proper sanitary measures. Diseased animals should be immediately isolated and infected stables should be strictly quarantined. It would be well to abandon the use of such stables until they have been thoroughly cleaned and disinfected.

The meat of aphthous animals is not considered dangerous as food for man. The milk of such animals is, however, highly infectious. The disease may also be contracted from eating infected butter and cheese. Consult: Nocard and Leclainche, *Les maladies microbiennes des animaux* (Paris, 1898); Murray, and others, "Special Report on Diseases of Cattle," in *United States Department of Agriculture, Bureau of Animal Industry* (Washington, 1892).

FOOTA TORO, fo͞o'tȧ tō'rō̆. See Futa Toro.

FOOTBALL. An outdoor game played by opposing teams, with an inflated ball. The main object on each team's part is the passing the ball over or through the goal in the other team's territory. It is principally played in Great Britain, North America, and Australia, but varieties of it may be found in many parts of the world. In the Philippines and through the Polynesian Islands it is played with a light ball made of thin split fibres of the bamboo ingeniously twisted and interlaced. The Eskimo play it with a similar ball made of strips of leather. The Faröe Islanders and the Maoris of New Zealand both play a native football. The ancient Greeks and Romans played a game somewhat akin to football. English lads in very early times made use of the bladder without the covering in a contest out of doors. Barclay, an early poet (d. 1552), describes the game graphically, and William Fitzstephen, in his *Vita Sancti Thomæa*, at the end of the twelfth century notes the well-known game of ball played on Shrove Tuesday. So popular did it become that its history is for centuries almost entirely one of futile repressive measures. Edward II. (1314) forbade it on account of "the great noise in the city [London] caused by hustling over large balls," and it fell under the ban of succeeding sovereigns, both in England and Scotland. James I., who favored athletic pastimes, condemned football "as meeter for laming than making able the users thereof." With the triumph of Puritanism came the decadence of football; though it was maintained here and there as a game between villages, the goals at either end sometimes being as far apart as one village from another, and it was played intermittently and without any rules but tradition well into the nineteenth century. By 1849 it was played in the English universities, but its official entry into modern life, as a defined game, was in 1863, when rules were drawn up by players of the University of Cambridge and representative old public school men, and the present 'association' game came into existence by the federation of clubs known as the 'Football Association.' This association failed to satisfy those who had for years followed the game under the traditional rules of Rugby school, and in 1871 the 'Rugby Football Union' was established, and rules formulated for all those following that style of play.

In America the game had an independent origin, with varying practices and fortunes. It was played at Yale as early as 1840, and continued in a somewhat desultory manner until 1859. Then came a period when it fell into desuetude. It does not appear again as an active force until 1870. From that time onward its growth and popularity has been uninterrupted. Lack of uniformity in methods and rules threatened to restrict its sphere. A beginning of uniformity was made in 1873, when Columbia, Rutgers, Princeton, and Yale met in convention, and in 1875 the regular Rugby Union rules of that year were adopted; but after the first matches of that year it soon became evident that those rules were not adapted for America. In 1876 they were varied in material points, and they have been in continuous evolution ever since. The game played in Australia is, in like manner, an outgrowth of the English game. The Gaelic game is Irish football under its own rules, and must not be confused with the ‘Irish Rugby Union’ play. In Great Britain playing football in both its styles, ‘association’ and Rugby, has become so universal that each of the four component divisions of the United Kingdom has its national association in each game, and there are international associations controlling the contests between the four. ‘Rugby’ is controlled by an ‘International Football Board’ consisting of twelve members—six from England, and two from each of the other nationalities. All international matches are played under rules subjected to its approval, but it has no jurisdiction over the game as played within the limits of the four separate unions. ‘Association’ in its international relations is under the control of an ‘International Association Board’ composed of eight members, two of whom represent England, Scotland, Wales, and Ireland respectively. In both games a selection committee of each country is responsible for the team to represent it. Besides the great international contests there are contests of groups of counties, and of counties within the groups; of towns, one against the other; and of village against village. It is impossible to convey, in a general description, the extent of football ramifications in Great Britain. One illustration must serve: It is no unusual thing for the final match betwixt the ‘North’ and ‘South’ of England alone to be witnessed by 100,000 to 120,000 spectators, every one of whom pays for his admission, and most of whom have undertaken a railroad journey of from 20 to 300 miles to be present at the game.

In the United States the interest in football is not less keen, but is more restricted, little interest being taken in any other matches than those between the great universities; but 30,000 to 40,000 spectators at one of these have been recorded. There is no national association. The governing body nearest approaching that definition is the ‘Rules Committee’ of the University Athletic Club of New York.

Association Football. This, the oldest of the organized games, differs in almost every detail by which a score is made, from both ‘Rugby’ and the ‘American’ game. It is more showy and active; kicking the ball is the almost exclusive method of play, nobody but the goal-keeper being allowed to touch the ball with his hands. It follows that the ball must in a very short period be in play in many different parts of the field, and that the area of contest, and the exhibition of skill, strength, nerve, and agility, must shift rapidly from point to point. The game is played on ground not more than 200 or less than 100 yards in length, and not more than 100 or less than 50 yards in width. The limits are marked by a white line and flags. The side lines are known as ‘touch lines,’ the end lines as ‘goal lines.’ The goals are upright posts, eight yards apart, and a crossbar eight feet from the ground. The ball is round, 27 to 28 inches in circumference, and when first put in play weighing not more than 15 ounces. It must pass *under* the crossbar between the goal posts to score. Eleven players constitute a team, i.e. one goal-keeper, two full-backs, three half-backs, and five forwards. The goal-keeper is in the most critical position; upon him in the last instance depends victory or defeat, and the laws leave him a wide margin in preventing a goal. The most widely essential quality in the association game is kicking of various degrees, from keeping the ball dribbling along at the player’s feet until a favorable position is obtained, to sending it skying over half the field to his colleague, or keeping it low and swift, so as to pass under the goal bar.

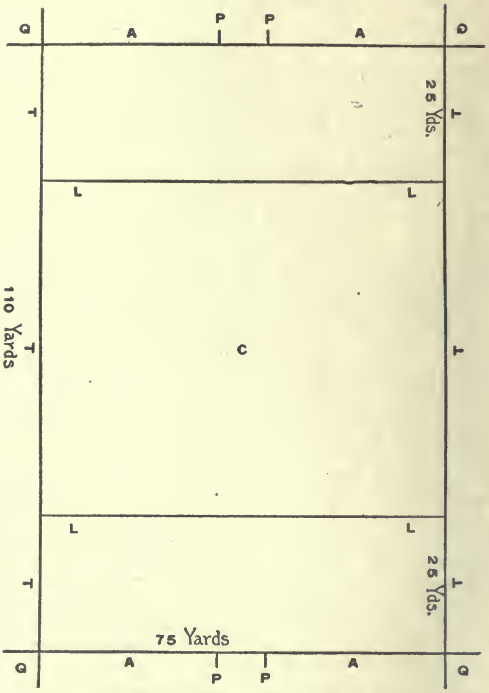
‘Rugby’ Football is played by fifteen players on each side, on a field not exceeding 110 yards long and 75 yards broad. The boundaries are defined by white lines; the ends of the boundary are called goal lines, the sides touch lines. In the centre of each goal line two goal posts are placed, 11 feet high and 18 feet 6 inches apart, and joined by a crossbar 10 feet from the ground. *Over* the bar and between the posts the ball must be kicked to score a goal. The ball is oval, from 11 to 11½ inches long, 30 to 31 inches in long circumference, 25½ to 26 in widest circumference, and weighing from 13 to 14½ ounces. The choice of in-goals, or the kick-off, is tossed for; the game is started by a kick-off. A kick-off is a place kick (i.e. the ball is placed on the ground and kicked) from the centre of the field of play. The opposing side must not stand within 10 yards, or charge until the ball is kicked. At the time of the kick-off all the kicker’s side must be behind the ball. The ball may then be kicked or picked up and run with by any player who is on-side (except that it must not be picked up when in a scrimmage, or it has been put down after it has been fairly held, or when it is on the ground after a player has been tackled—i.e. held by one or more players of the opposite side). It may be passed or knocked from one player to another. When it is firmly held the one in possession cries ‘Down!’ the forwards of either side hurry up and a scrimmage is formed, the eighteen packed tightly round the ball, every one trying either to force the ball out toward his goal, or to ‘screw’ his opponents —i.e. slide them off the ball, so that his own team keeps well on it. Two methods have developed from the early scrimmage, each unlawful, but each played so uniformly and universally as to have become unwritten laws—i.e. ‘wheeling’ and ‘heeling.’ In wheeling the ball is secured on the formation of a scrimmage and nursed, until the bias of the scrimmage is felt, either to the right or left; then the wheel is made on the most favorable side by the back row bringing the ball round to the front, while the front row slides off its adversaries. In ‘heeling,’ possession of the ball is obtained, as in wheeling; then the forwards mask their manœuvre by a feint of packing hard, and heel the ball out. When the scrimmage is broken up the players break away *en masse*, and follow the man who holds the ball at full speed, while the object of the holder is to transfer it to one of his own side who is in a more advantageous position than himself, either by dribbling the ball with the foot or passing it by hand. The ball is in touch when it goes, or a player carries it, across the side, or touch, lines. It then belongs to the side opposite that last touching it in the field of play, except when carried in. One of the side to whom it belongs puts it into play again by bounding it on the field at right angles to the touch line, and then running in with it, or passing it, or throwing it in;

or he scrimmages it at any spot at right angles with the touch line, between 5 and 15 yards from the place where it was in touch.

THE AMERICAN GAME. The rules of the English Rugby Union, as they were in 1875, were adopted as the foundation of the American game; but in 1876 they were revised, so that in place of the former play the man who happened to have the ball when a 'down' was made played it to one particular man—the 'snap back.' In English Rugby, too, the ball might be rolled out of a scrimmage by any player and at no stated opening. In the American game one player controls its coming out and awaits the quarter-back's signal for it. Then, again, in the English Rugby any man may receive the ball; in the American the same man—the 'snap back'—always receives it, and its destination then becomes part of a preconcerted and well-rehearsed play. He puts the ball in play behind him, and the men in his line act in concert, in a general, prearranged attack on the enemy's line, with the object of clearing a path for the man who runs with the ball. The work of the rushers has been specialized, light men put where their qualifications are most effective, and heavy men in the same way; end men selected who could make runs and free catches off short kicks. In the same way, guards to protect the quarter-back when he passed the ball, and tackles to break up the opponents' play, were early specifically selected for qualifications and specialized for the work. Every year has brought new plays to the fore, and every rule has been the subject of infinite thought on the part of the players, mainly to design some method of meeting them, each play in its turn resulting in still new rules—to wit, the 'block system' of the early eighties was met by 'the five-yard rule,' designed to prevent one side keeping possession of the ball unduly, without material advance or retreat, by enacting that if in three 'downs,' or attempts to advance the ball, the side doing so has not made 5 yards toward the opponents' goal, or retreated 20 yards toward their own goal, they should surrender possession.

'Interference' was restrained, but developed into 'mass plays'—the grouping of a body of men some distance back of the line and starting them before the ball was put in play. This tendency called into existence the Rules Committee of the University Athletic Club, whose annual revisions have aimed at the greater protection of a man on a fair catch, and the encouragement of kicking and of a more open game generally. Its efforts are unceasing; but so are those of the players to devise new tactics, and in January, 1902, the committee had to meet the question of restraining the 'battering-rams' which had been previously hammering the men in the line, with serious injuries as a result. The time of play is two halves of thirty-five minutes each, with ten minutes intermission. Any player injured can be removed from the field and another player substituted, in which respect the American game differs from the British play, where each team has to play the game out with the members with which they start the game, or such of them as are capable of play. These differing rules may account for the marked difference in the casualties in the field: a captain who has no reserves takes more care of his men than he who can replace an injured player with a substitute.

The American game is played upon a level field 330 × 160 feet in area, upon which transverse parallel lines are marked, beginning from each end of the field and approaching the middle. They are known as the five-yard line, ten-yard line, etc. They are merely aids in marking the progress of the ball. In the centre of each goal line, or end boundary line of the field, stand the goals, which consist of two posts supporting a cross-bar of wood 10 feet from the ground. The object of the game is to advance the ball from the centre of the field, where it is started, until it can be touched down at some point beyond the opponents' goal line. A *touch-down* counts 5 points, and entitles the side making it to a *try at goal*, which, if successful, counts 1 point more. Besides kicking a goal in this manner, a *field goal* may be kicked at any time, and counts 5. A *safety*—the only other method of scoring—consists in making a touch-down behind one's own goal line. It counts 2 for the opposite side, but gives the team making it the privilege of kicking the ball out of danger—that is, away from the vicinity of their own goal, and may thus be the means of preventing the opposite side from making a touch-down and larger score. The team holding the ball may in a game lose possession of it on a fumble, or by kicking it, or on failure to advance it a stated distance in four successive runs or rushes, or as a penalty for illegal play.



THE AMERICAN FOOTBALL FIELD.

The ball is started from the middle of the field at the beginning of each half and after a goal has been made, by a *place kick* (ball kicked from a position of rest on the ground). The object of the *kick-off* at the beginning of the game is to send the ball as far as possible away from the goal of the side kicking the ball, no score being given even if the ball pass between the goal posts. The opponents attempt to catch the ball and return it either by running or kicking. If by the latter they may make a *fair catch* (marking the ground with the heel while catching, which insures protection from being tackled), which may then be followed by a *free kick.* If the catcher runs with the ball his companions form the *interference* by running before him so as to protect him from the assaults of the opposite team. It is a *down* when the runner with the ball is tackled and held. If in three consecutive downs thereafter (i.e. four downs in all) he fail to advance the ball five yards, it goes to the other side. Upon the kick-off the kicking side may not again touch the ball until the kicker has reached a point on a line with the ball, or until the ball has touched the person of an opponent. As a rule, therefore, the opponents succeed in obtaining the ball on the kick-off.

After each down the teams line up for the *scrimmage.* The team possessing the ball take positions as follows: Centre rush in middle, right and left guards on either side of him, right and left tackles next. to the guards, and right and left end rushes on the respective ends of the lines. These players form the rush line or forwards. Directly behind the centre rush is the quarter-back, and in their proper positions in the rear are the full-back and the right and left half-backs. The opposition players will line up in a position somewhat similar, facing the other team. The centre snaps the ball back to the quarter-back, who passes it to a third player. The opposing team at once atempts to reach the man with the ball by breaking through the formation. The players of the latter attempt to block the onslaught of their opponents, and some of them at the same time form the interference and endeavor to protect and clear a path for the runner with the ball, having passed through any available opening in his opponents' line. The interference carries the ball as far down the field as he may. The interference cannot use hands or arms in obstructing the opponents' play, although the runner himself may do so. The opponents may use hands and arms in pushing the former away, but for no other purpose. In interfering, players must not get beyond the line of the ball until the latter has actually been put in play. If they do so they are declared off-side. Infractions of the above rules incur a loss of the ball, if that is possessed by the side which has offended, or if not, a loss of 10 yards of distance. If a team fails to advance the ball 5 yards in three downs it loses the ball, which then goes to the other side. That side then attempts to advance the ball in the opposite direction. If it makes the required 5 yards it may retain the ball for three more attempts, and so sometimes the player who has received the ball from the quarter-back succeeds finally in making a touch-down in a number of successive rushes. Occasionally, protected by good interference or with a clear field ahead, the man with the ball will make a touch-down by one long run across the field. Having made a touch-down, which counts 5, a try at goal is allowed, and after a goal the ball is brought back to the centre of the field again for a kick-off, and the game proceeds as before.

The *Canadian* game, which is popular in a number of Provinces, is played on a field of 110 × 65 yards, with fifteen men on a team. The 'heeling out' of the ball is a feature of the game. Points may be scored in several ways, the playing of the game as well as its scoring partaking largely of the character of the English Rugby game. *Gaelic football* is a very old Irish game which has been revived in recent years. It is played by teams of from fourteen to twenty-one players, generally fifteen. Besides the usual goal posts, there are outer point posts, which give added opportunities for scoring. The teams line up for play in two parallel lines, the opponents holding hands. The ball is then thrown into the centre of the line, and the game begins at once. Having caught the ball, a player may advance it by kicking or by striking with the hand; but he may not throw or carry it. A resulting method of play is that of 'hopping,' by which the ball is kept bounding between the hand and the ground while the player rapidly advances down the field. The game is characterized by active playing and hard kicking.

Consult: Budd, *Football* (London, 1897); Camp, *How to Play Football* (New York, 1894); Camp and Deland, *Football* (Boston, 1896); Lewis, *Primer of College Football* (New York, 1896); Robinson, *Rugby Football* (London, 1896); Shearman, *Athletics and Football*, Badminton Library (London, 1887), or "The Ethical Functions of Football," by Thwing, in the *North American Review* for November, 1901.

FOOTE, ANDREW HULL (1806-63). A distinguished officer of the United States Navy. He was born in New Haven, Conn., on September 12, 1806, the son of Samuel A. Foote (q.v.); studied at West Point for several months, and became acting midshipman in the navy on December 4, 1822. He was commissioned lieutenant on May 27, 1830; from 1837 to 1840 was executive officer of the *John Adams*, of the East India Squadron, during its cruise around the world, and from 1841 to 1843 was stationed at the Naval Asylum in Philadelphia, of which during the last two years he was in full charge. He was executive officer of the Boston Navy Yard from June, 1846, to June, 1848, and from 1849 to 1851, as commander of the brig *Perry*—his first independent command—cruised along the African coast for the purpose of protecting American commerce and suppressing the slave trade. In December, 1852, he was promoted to the rank of commander. After four years of shore duty he was appointed to the *Portsmouth*, April 5, 1856, and was ordered to join Commodore Armstrong's fleet on the East India Station. On arriving at Canton he established fortified posts on shore for the protection of American residents; but Commodore Armstrong soon afterwards ordered that the American marines be withdrawn, and while Foote was making arrangements to this end he was fired on from the so-called Barrier Forts (q.v.), which he stormed and captured a week later, acting under Armstrong's orders. Soon after his return —in October, 1858—he was appointed commandant of the Brooklyn Navy Yard, which position he relinquished, with the rank of captain, in August, 1861, soon after the beginning of the Civil War, to accept the command of the naval operations in Southwestern waters. On September 6, 1861, he assumed command at Saint Louis, and for some time devoted himself with great energy to the task of preparing his flotilla for action. On February 6, 1862, he captured Fort Henry, and on the 14th he attacked Fort Donelson, before which Grant with his army had arrived two days earlier; but was repulsed, and he himself was wounded. (See FORT HENRY AND FORT DONELSON.) Island No. 10 (q.v.), after a siege by Foote and the forces under Pope, surrendered on April 7. On May 9, his wound having become serious, Foote left the command of the fleet in the hands of Capt. Charles H. Davis, and on July 17, 1862, at his own request, was formally detached from the Western Flotilla. He had become a flag officer in November, 1861, and on July 16 was promoted to be a rear-admiral. For several months in 1862-63 he was chief of the Bureau of Equipment and Recruiting, and on June 4, 1863, was appointed to succeed Rear-Admiral Dupont as commander of the fleet off Charleston, but died at New York, on June 26, while on his way to assume the duties of his new position. Foote published a book entitled *Africa and the American Flag* (1854), based largely on his African cruise of 1849-51. Consult Hoppin, *Life of Rear-Admiral Andrew Hull Foote* (New York, 1874).

FOOTE, ARTHUR (1853—). An American composer, born at Salem, Mass. He studied piano and harmony with Stephen A. Emery, and subsequently at Harvard University (class of 1874) with John K. Paine, continuing for a year after graduation. He was leader of the Glee Club and also chorister, his first published composition being the class-day song. On leaving college he studied piano and organ playing with B. J. Lang, and shortly afterwards settled in Boston. He gave many pianoforte and organ recitals there and elsewhere. His first composition performed in public was a gavotte, which Madame Essipoff played in a so-called 'American' concert in Boston in 1877. His first larger composition to have success was the *trio* in C major for piano and strings, about 1883. His compositions include works for orchestra (*Serenade* in E major for strings; overture, *In the Mountains;* prologue, *Francesca da Rimini;* suite in D minor); chamber music; chorus and orchestra (*Wreck of the Hesperus; Skeleton in Armor; Farewell to Hiawatha*); much church music, organ and piano pieces; and about sixty songs, among them the popular *Irish Folk-Song; I'm Wearing Awa'; In Picardie; O Swallow, Swallow;* and *On the Way to Kew.* Foote's work has been rather more along classical lines (so called) than in the romantic school, but a tendency toward the latter showed itself in his later compositions.

FOOTE, HENRY STUART (1800-80). An American politician, born in Fauquier County, Va. He graduated at Washington College, Lexington, Va., in 1819, and after studying law and being admitted to the bar in 1822, removed in 1824 to Tuscumbia, Ala., where he practiced his profession and edited a Democratic newspaper. Two years later he removed to Jackson, Miss. He soon became a leader of the Democratic Party in his State, allying himself at first with the extreme States Rights branch. In 1847, however, he became a pronounced Unionist, and after a sharp contest was elected, in 1847, to the United States Senate. He favored the annexation of Cuba, Yucatan, and Mexico, declaring that only thus could the continued possession of California and Oregon by the United States be assured. He was the author of the proposal for a grand committee of thirteen, which, after Webster had spoken in its favor, was accepted. It was this committee with Clay as its chairman that drew up the famous compromise measures. Later he introduced the 'finality resolutions,' by which the compromise laws were declared to be a "final settlement of all controversies growing out of slavery." In 1852 he resigned his seat in the Senate to enter the contest for Governor of Mississippi as the Unionist candidate in opposition to John A. Quitman, the leader of the Secessionist party. Quitman, soon realizing that there was no chance of his own election, withdrew in favor of Jefferson Davis, in spite of whose personal popularity, however, Foote was elected. On the conclusion of his term as Governor, Foote removed to California, but returned to Mississippi in 1858, and again entered the fight against the secession movement, participating in the Southern Convention at Knoxville, Tenn., in 1859, as one of the strongest opponents of disunion. Settling in Nashville, in spite of misgivings, he cast in his lot with the Confederacy upon the secession of Tennessee, and was chosen a member of the first and second Confederate Congresses. His personal attacks on Jefferson Davis, his old rival, were bitter and scathing. He was in Washington even before Lee's surrender, and after the restoration of peace, remained in that city, where his counsel was sought by the Northern leaders in regard to reconstruction matters. He became a strong supporter of Grant, whose Southern policy he favored, and by whom he was made director of the United States Mint at New Orleans, which position he held until shortly before his death. He published *Texas and the Texans* (1841); *History of the Southern Struggle* (1846); *History of the Civil War: or, Scylla and Charybdis* (1867); and *Personal Reminiscences.*

FOOTE, MARY HALLOCK (1847—). An American artist and novelist, born in Milton, N. Y., November 19, 1847. She studied art in New York, and in 1876 married Arthur D. Foote, a mining engineer. Since then she has lived in California, Colorado, and Idaho, which have given themes for her novels and drawings. She has also furnished elaborate illustrations for Longfellow's "Skeleton in Armor," and "The Hanging of the Crane." Representative of her fiction are: *The Led Horse Claim* (1883); *The Last Assembly Ball* (1889); *John Bowdoin's Testimony* (1886); *Cœur d'Alène* (1894); *The Chosen Valley* (1892); *In Exile* (1894); and *The Cup of Trembling* (1895). In all these the scenes are taken chiefly from Rocky Mountain country.

FOOTE, SAMUEL (1720-1777). An English actor and playwright, born at Truro, in Cornwall. In 1737 he entered Worcester College, Oxford, but left without a degree, and proceeded to the Temple. His fortune soon dissipated at the London coffee-houses, he turned to the stage for a means of support (1744). In 1747, with a piece entitled *Diversions of the Morning,* he opened the Haymarket Theatre, where he was at once director, actor, and dramatic author. In this and other pieces he introduced well-known living characters, and by his admirable powers of mimicry succeeded in drawing large audiences, till the theatre was closed by order of the magistrates. He, however, managed to continue his dramatic performances by calling them 'teas.' These 'teas' closed in 1753, and Foote returned to the regular stage, writing and adapting many plays, and acting in many parts, in London, Dublin, and Edinburgh. In 1766 he broke his leg by a fall from his horse, and amputation was found necessary. Full of resources, he turned the incident to account on the stage, composing parts expressly adapted to his own state. He died October 21, 1777. Among his plays are *The Minor*, *The Liar*, and *The Mayor of Garratt*. Foote had a great reputation as a wit. His *Works* were edited by John Bee (Badcock) (London, 1830). Consult Cook, *Memoirs of Samuel Foote, with a collection of his bons mots* (London, 1805).

FOOTE, Samuel Augustus (1780-1846). An American politician, born in Cheshire, Conn. He graduated at Yale in 1797, and practiced law. After serving for some time in the Legislature he was at different times sent to Congress as a Whig (1819-27). During the following six years he was in the Senate. He was the author of the resolution 'on public lands,' which provoked the great debate between Senator Hayne of South Carolina and Webster of Massachusetts.

FOOT GUARDS. Select regiments of infantry, organizations common to European armies. In the British Army it includes the First, Second, and Third battalions of Grenadiers (q.v.), the First, Second, and Third battalions of Coldstream Guards (q.v.), the First, Second, and Third battalions of Scots Guards, and the Irish Guards, the First Battalion of which was formed in 1902. Like the German guard-corps, they are not locally distributed throughout the Empire, but have permanent stations. See Household Troops.

FOOTMAN MOTH. A name among British lepidopterists for the small yellowish gray moths of the family Lithosiidæ, allied to the tiger-moths.

FOOT-POUND. The unit of work (q.v.) in the foot-poundal system, and corresponding to the amount of work required to raise one pound one foot vertically against the force of gravity at sea-level in latitude 45°. See Mechanical Units.

FOOTPRINT, Fossil. See Fossil; Ichnology.

FOOT-ROT. A hoof-disease of sheep. Two varieties are recognized, the commoner consisting of an excessive growth of hoof, which at the toe, or round the margin, becomes turned down, cracked, or torn, and thus affords lodgment for sand and dirt. Irregular wearing of the hoof is the cause, and hence the prevalence of foot-rot in soft rich pastures, and especially among sheep previously accustomed to bare, rough, or upland walks, where the hoof is naturally worn down by the greater amount of walking necessary to procure sustenance. Taken in time, when lameness is first apparent, and before the hoof is cracked, and the foot inflamed, a cure rapidly follows the careful paring of the superfluous and diseased hoof; indeed, further treatment is scarcely necessary, unless the vascular parts have been laid bare, when a little tar may be applied as a mild astringent and protection from flies. When, from inattention or neglect, the hoof is separated from the sensitive parts beneath, when ulcers appear on the sole, or proud flesh develops, active astringents or mild caustics are necessary. Butter of antimony, diluted with an equal quantity of tincture of myrrh, is a good remedy when cautiously and temperately used. A convenient paste, which in inexperienced hands is safer than a fluid caustic, may be made with equal weights of flowers of sulphur and finely powdered sulphate of copper, rubbed up to the needed consistency with lard or oil. Many have great faith in a mixture of this salt of copper with gunpowder and lard. The second and more troublesome variety is allied to what is termed 'foul in the foot'; instead of commencing at the ground surface, it begins in the interdigital space or at the coronet, and is contagious. The foot is hot, tender, and swollen around and immediately above the coronet. There are ulcerations in the interdigital space, and the swelling, and subsequently the appearance of proud flesh, cause a separation of the toes. When the tenderness and heat are great, poultices are advisable; but in the milder cases and earlier stages, the parts should be well washed with a solution containing to the pint of water half an ounce each of suphuric acid and oil of turpentine. When ulcers appear, they must be touched with lunar caustic, or dressed with the paste already recommended. In the treatment of contagious foot-rot preference should be given to antiseptic solutions.

FOOTWALL. A term used in mining, to indicate the lower wall of an inclined ore body or coal seam. It underlies the ore body immediately and often serves as a slanting floor on which tracks can be laid for hauling up the ore. See Hanging Wall; Mining.

FOOT-WASHING. An Eastern custom of very early times, having its origin in necessities produced by climate and modes of dress, and in the obligations attached to the rites of hospitality. In the most primitive times the feet were without covering, and sandals afforded protection only to the sole. Consequently, after any journey in the heat and sand, bathing the feet, if not absolutely required, was at least convenient and refreshing. From Scripture and other sources, we learn that the servants of a household were accustomed to perform this work for the guests, and thus it became a significant sign of humility. In memory and imitation of the example of Christ at the Last Supper (John xiii.), the earliest Christians were accustomed to regard it as a praiseworthy act of piety. By the end of the fourth century it was specially connected with the observances of the Thursday before Easter, when, at least in the churches of Africa, Gaul, and Milan, it was the custom for the bishop to wash the feet of the newly baptized with solemn ritual observances. When infant baptism became the rule, foot-washing was dissociated from the administration of the sacrament; but as a liturgical custom observed on Maundy Thursday, it became more and more generally practiced. Earlier editions of the *Ordo Romanus* do not mention it, but the later ones speak of the Pope performing the ceremony for twelve subdeacons. As in monasteries where was a twofold observance, by the brethren among themselves and by the abbot and others for numerous poor people, so the Pope and other bishops added the washing of the feet of representative poor men, who also received food and gifts. It was also frequently, and is still in some courts (e.g. that of Vienna), practiced by monarchs. At Rome, while the Gospel narrative is sung (from whose first words in Latin, *Mandatum novum*, 'a new commandment,' John xiii. 34, the name of Maundy or Mandate Thursday is derived), the representatives of the Apostles take their seats, dressed in white woolen tunics, and the Pope, in similar attire, sprinkles a few drops of water on the right foot of each, then wipes and kisses it. After this a repast is given, at which the Pope and his Cabinet wait on the old men, who, at the close, take with them the tunics and towels, with the addition of a small gratuity in money. The Anabaptists, at the Reformation, continued the practice. The Moravians revived it, but without strictly enforcing it. In modern times it has been regularly practiced among the Dunkers (see GERMAN BAPTIST BRETHREN), Winebrennerians, and the Glassites or Sandemanians.

FOPPA, fȯp′pȧ, VINCENZO (called Il Vecchio) (?-1492). An Italian painter, born at Brescia. He was a pupil of Squarcione. Little is known of his life until he went to Milan, where he executed many important works. These were generally in fresco, and are now destroyed. Among them was a series of scenes from the life of Trajan, done about 1456. Foppa is generally considered the founder of the Milanese School. The pictures that remain of this uncommon and interesting master are very few; the best of them are: "Saint Jerome Praying," and a "Crucifixion," both at Bergamo; a fine altar-piece in Santa Maria di Castillo, Savona; "Saint Sebastian," and some fragments of fresco at the Brera in Milan; and "The Adoration of the Kings," in the National Gallery, London. The last years of his life were spent at Brescia, whither he returned in 1489.

FOPP′INGTON, LORD. An ostentatious, ridiculous man of fashion in Vanbrugh's *Relapse*. He also appears in Cibber's *Careless Husband*, and in Sheridan's *Trip to Scarborough*, an adaptation of Vanbrugh's comedy. The character was suggested by Sir Novelty Fashion in Cibber's *Love's Last Shift*. Cibber himself created the rôle and made his reputation with it.

FORAGE (in agriculture). See FEEDING STUFFS.

FORAGE (OF. *fourage*, Fr. *fourrage*, from OF. *forrer*, to forage, from *forre*, *fuerre*, Fr. *feurre*, from ML. *fodrum*, forage, from *voder*, AS. *fōdor*, Eng. *fodder*, OHG. *fuotar*, Ger. *Futter*, food; connected also with AS. *fōda*, Eng. *food*, and with Gk. πατεῖσθαι, *patcisthai*, to feed). In military usage, the fodder issued by the Government for animals, the property of the State. In the United States Army, the forage ration for a horse, as provided in the Army Regulations, is 14 pounds of hay and 12 pounds of oats, corn, or barley; it being left to the department commander to reduce the ration when necessary. Where grazing is practicable, or when little labor is required, commanding officers are authorized to order a judicious reduction of the allowance. Forage is furnished only to officers for the horses owned and actually kept by them in the performance of their official duties when serving with troops in the field or at military posts and stations.

FORAGING ANT. An ant of the Central American genus Eciton, usually called army ants in Nicaragua, because they go about in large bodies, making forays upon insects and other small animals. These columns may be three or four yards wide, and include many thousands of individuals. As they march forward smaller columns are pushed out ahead or on the flanks, which find and flush the prey. Larger animals flee; insects try to leap away, but more often jump into the midst of the ants, and even the largest are soon overpowered and torn to pieces. The ants explore thickets and brush-heaps, driving everything to the twigs and then catching and pulling them down; but spiders often escape by letting themselves hang by a silken thread. Birds accompany such a foray through the forest, and dart at the escaping insects, but do not eat the ants. Several species of Eciton inhabit the American tropics, one of which devotes its excursions to harrying the nests of a certain small and timid ant (Hypoclinea), which it ousts from its galleries and robs of pupæ and larvæ, but does not otherwise injure. "The moving columns of Ecitons are composed almost wholly of workers of different sizes, but at intervals of two or three yards there are larger and lighter-colored individuals that will often stop, and sometimes run a little backward, halting and touching some of the ants with their antennæ. They look like officers giving orders and directing the march of the column."

These ants are of various species and differ in size, food, and methods of foraging. The Ecitons are remarkable in having no permanent home. On the contrary, they make a temporary habitation in some hollow under a log, or in the ground, where great masses cluster together like a hanging swarm of bees, in the centre of which the larvæ and pupæ are kept warm. These, with their nurses, seem to occupy a chamber within a living nest, and tunnel-like entrances are kept open along which food is carried by those left at work outside. No ants show a greater sense of organization and mutual helpfulness than do these, and they seem to stand at the head of the tribe in point of intelligence. A circumstantial account of several species is given by Belt, in his *Naturalist in Nicaragua* (London, 1888), from which the sketch here given has been condensed.

FOR′AKER, JOSEPH BENSON (1846—). An American politician and legislator, born at Rainsboro, Highland County, Ohio. In 1862, at the age of sixteen, he enlisted as a private in the Eighty-ninth Ohio Volunteer Infantry, and at the close of the war received the brevet rank of captain. Immediately after the close of hostilities he entered the Ohio Wesleyan University at Delaware, Ohio, and two years later entered the junior class at Cornell University, where he graduated in 1869. He studied law and was admitted to the bar at Cincinnati, where he practiced with success until 1879, when he was elected a judge of the Superior Court. He resigned from the bench in 1882, and in 1885 was elected Governor of Ohio on the Republican ticket. He was reëlected in 1887, and was defeated for a third term, in 1889, by James E. Campbell, although all the rest of the Republican State ticket was elected. From his defeat as Governor in 1889 to 1897 he was engaged actively in the practice of law at Cincinnati, gaining a reputation as a corporation attorney. In 1897 he became United States Senator. In the Senate he immediately took an active and aggressive part in the debates, being one of the most radical advocates in that body of the war with Spain in 1898.

FORAM′INIF′ERA (Neo-Lat. nom. pl., from Lat. *foramen*, hole + *ferre*, to bear). A name given by the French zoölogist D'Orbigny, in 1826, to a group of minute animals, which at that time were regarded as mollusks, because of their remarkable and beautiful shells. They were even ranked with the cephalopods because many of them possess shells spirally coiled, like that of the nautilus. In 1835, however, Dujardin recognized their true nature, and since his day the Foraminifera have been considered a subdivision of the Protozoa. They are now ranked as an order of Rhizopoda (q.v.), distinguished from the amœba and its near allies by the form of the pseudopodia, which are very extensile and thread-like, and are constantly anastomosing so that they form a beautiful network of granular protoplasm. Another feature which serves to distinguish the Foraminifera is the presence of a shell, although not all rhizopods which have shells are of this order. The shell or 'test' of the Foraminifera may be chitinous, or calcareous, or arenaceous (that is, made up of particles of sand, mud, sponge-spicules, or other foreign material firmly glued together), but it is never siliceous. The shells are distinguished as 'perforate' or 'imperforate,' according as they have their walls penetrated, or not, by minute openings or canals through which the pseudopodia project. In nearly all cases there is a large opening through which the animal within the shell comes in contact with the surrounding water, and often there are two or more of these 'general apertures.' In the imperforate forms, the pseudopodia are extended only through these general apertures. The Foraminifera with chitinous shells are all *Imperforata;* those with arenaceous shells are usually *Imperforata*, but there are many perforate forms; those with calcareous shells show two very distinct sorts of tests, one group having them white, opaque, like porcelain, and imperforate, while the other has them transparent, glassy, and perforate. Marking or sculpturing of the surface of the shell is very common in both groups. In regard to the form of the shell we find a most extraordinary variety, but the most important point is whether they are monothalamous (unilocular), that is, composed of a single chamber; or polythalamous (plurilocular), that is, made up of several or many chambers. The latter forms arise by budding, from a single chamber, the buds remaining attached to the parent. Now since the monothalamous shells may be spherical, ovate, spindle-shaped, star-shaped, or tubular (straight, curved, or coiled) and symmetrical or quite asymmetrical, it follows that the polythalamous shells may be very complex and irregular. They are often very beautiful and sometimes reach a considerable size. The great majority of the Foraminifera are known by their shells alone, comparatively little being known of the animals themselves. In those which are known the contractile vacuole is wanting, and even the nucleus is usually indistinguishable, so that their structure would seem to be extremely simple.

In regard to their physiology we know that food is taken into the body in the form of minute organic particles, by means of the flowing or streaming movements of the protoplasm which makes up the pseudopodia. In addition to this food it is possible that some organic matter in solution in the water is also absorbed and used, for the ability to take carbonate of lime in solution and make use of it to form their shells is one of the most characteristic and obvious features of these animals. Their methods of reproduction are only partially understood. The processes of fission and of budding are constantly going on. In certain forms, reproduction takes place by the formation of spore-like young. These exceedingly minute germs move about by a single flagellum. Such a flagellum-bearing embryo is called a 'flagellula.' The Foraminifera are chiefly marine animals, but those with chitinous shells are found mostly in fresh water. They are all very small, practically microscopic, though the white shells of many of the marine forms are large enough to be seen with the naked eye; quite a number are from one to two millimeters in diameter, and the well-known genus Orbitolites has a polythalamous shell, sometimes 20 millimeters across, while Nummulitis is an inch in diameter.

The shells of Foraminifera are found all over the ocean floor except in the Arctic regions, and in many places form deposits of great extent and thickness. It was formerly supposed that the animals lived swimming about in the sea, and that it was only at death that the shells sank to the bottom, but it is now known that comparatively few species are pelagic, and it is probable that most species live on the bottom throughout life. Geologically, the Foraminifera occur from Cambrian times down to the present, though they have been most abundant apparently since the close of the Paleozoic era.

The classification of the Foraminifera is a matter of unusual difficulty, owing to the very great individual variation that occurs in the form and appearance of the shell. It is very doubtful whether the 'species' of this order are comparable with the species of higher groups, since little is known in regard to their reproduction and limits of variation. Ten families are now generally recognized, the lines of division being based on the composition of the shell, whether polythalamous or not, whether perforate or not, and on the relative arrangement of the chambers. The best-known families are the Gromidæ, which includes the fresh-water forms, of which Gromia and Microgromia are familiar examples; the Miliolidæ, including the huge Orbitolites; the Globigerinidæ, with the widespread Globigerina; and the Nummulinidæ, including the well-known and characteristic fossil forms Fusulina and Nummulites.

Fossil Foraminifera. The oldest known Foraminifera appear in the Lower Cambrian rocks of the Province of New Brunswick, Can., where occur some minute spherical shells that cannot be distinguished in respect of either size, form, or microscopic structure from the modern species *Orbulina universa.* Associated with these are species of Globigerina, very like those of modern times. Many Foraminifera are scattered through the overlying formations up to the Carboniferous system, where they suddenly appear in great abundance. Whole beds of limestone in Europe, Asia, Japan, and North America are formed by the closely crowded shells of the genera Saccamina, Endothyra, Fusulina, and Schwagerina. The two latter genera are not found above the Permian. Other extinct genera in the Carboniferous rocks are associated with species of genera that are still living in the Atlantic Ocean and the Mediterranean Sea. The Mesozoic rocks have also their Foraminifera in abundance. The genera of the family Lagenidæ are predominant in the Liassic and Jurassic systems. The chalk deposits of the Cretaceous age of Europe and America consist largely of foraminiferan shells (especially Globigerina and Rotalia), together with spicules of sponges. The members of the order reached their greatest development in Tertiary time, though most of the genera and species found in the rocks of that period are still living in the modern seas. The majority of these were more abundant in the earlier period than they are now. Certain other forms, like Orbitoides allied to Nummulites, are restricted to rocks of Tertiary age. Nummulites (q.v.) is an important index fossil of the Eocene series, in which its coin-shaped shells constitute great limestone beds in the Alps and Egypt.

The well-known Eozoön (q.v.), found in Laurentian limestones in Canada, has long been considered by some authors to be the oldest foraminifer, and likewise the oldest known fossil organism. Careful investigation has proved it to be a mineral concretion.

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FORBACH, fôr′bäg. A town in Lorraine, Germany, on an affluent of the Rossel, five and one-half miles southwest of Saarbrücken (Map: Germany, B 4). Glass, soap, and pasteboard are its manufactures. The place is mentioned as early as the tenth century under the name of Furpac. After the battle of Spichern, fought on the neighboring heights, August 6, 1870, the town was occupied by the victorious German troops. Population, in 1890, 9575; in 1900, 8209.

FORBES, fôrbz, ALEXANDER PENROSE (1817-75). Bishop in the Episcopal Church of Scotland. He was born in Edinburgh, and studied at the Edinburgh Academy, and under Rev. Thomas Dale, the poet, in Kent; he also attended the Glasgow University (1833), and won distinction as an Oriental scholar. In 1836 he obtained an appointment in the Indian civil service, and left England for Madras. Returning to his native country in 1839, he obtained a Sanskrit scholarship in Brasenose College. At Oxford he became associated with Pusey, Newman, and Keble; and in 1844 was ordained deacon and priest in the Church of England, and held a curacy. In 1846 he returned to Scotland for a while, but afterwards became Vicar of Leeds (1847). After the death of Bishop Moir, he was called to the See of Brechin (1848). In 1860 he was prosecuted for heresy, because he inculcated the doctrine of the Real Presence, but he made a powerful defense, and was acquitted with censure and admonition. His *Short Explanation of the Nicene Creed* (1853), and *Explanation of the Thirty-nine Articles* (1867-68), and various commentaries, reviews, etc., were highly esteemed. He edited the original lives of Saint Ninian, Saint Kentigern, and Saint Columba in the *Historians of Scotland,* vols. v. and vi. (Edinburgh, 1875); also *The Kalendars of Scottish Saints* (1872). He died at Dundee, Scotland, October 8, 1875. Consult Mackey, *Bishop Forbes: A Memoir* (London, 1888).

FORBES, ARCHIBALD (1838-1900). An English journalist. He was born in Morayshire, Scotland, in 1838. He studied at the University of Aberdeen; served for some years in the Royal Dragoons; and then became special correspondent for the *London Daily News,* in which capacity he accompanied the Prussian Army during the Franco-German War; witnessed the close of the Commune; visited India during the famine of 1874; accompanied the Prince of Wales on his tour through India (1875-76); and was in the Carlist War in Spain, the Servian War, and the Russo-Turkish War of 1877, etc. He lectured in Great Britain, the United States, and Australia. Among his many works are a military novel called *Drawn from Life* (1870); *My Experiences in the Franco-German War* (1872); *Life of Chinese Gordon* (1884); *William I. of Germany* (1888); *The Afghan Wars* (1892); *Tzar and Sultan* (1894); *Napoleon III.* (1898). He died March 30, 1900.

FORBES, DUNCAN, of Culloden (1685-1747). A Scotch judge and patriot, born November 10, 1685, probably at the family seat near Inverness. He was educated at Inverness Grammar School, and after completing his studies at the universities of Edinburgh and Leyden, became advocate at the Scottish bar in 1709. Through family influence he was soon appointed Sheriff of Midlothian, and rapidly acquired political power and a lucrative practice. In 1722 he became member of Parliament for Inverness; in 1725 was appointed Lord Advocate; and in 1737 reached the summit of his profession as Lord President of the Court of Session. His loyalty to the English Crown had been conspicuous in the Rebellion of 1715, and at the outbreak of 1745 he hastened north, and by his presence and influence did much to counteract the uprising. For advocating and exercising humanity toward the rebels he was accused as a suspect by Lord Lovat, who attacked Culloden House, his residence, but was spiritedly beaten off by the President and his people. The rebellion spread, and Forbes fled for refuge to the island of Skye. After the battle of Culloden, he returned and zealously discharged his duties until he died, December 10, 1747. He was the author of some important theological works. Consult: Duff, *Memoir* attached to the *Culloden Papers* (London, 1815); Bannatyne, *Memoir* attached to *Works of Duncan Forbes of Culloden* (Edinburgh, 1816); and Burton, *Lives of Simon, Lord Lovat, and Duncan Forbes of Culloden* (London, 1847).

FORBES, EDWARD (1815-54). An English zoölogist. He studied medicine and other sciences in Edinburgh and Paris, and in 1841 became naturalist of the surveying ship *Beacon* during a voyage to Asia Minor. In 1843 he became professor of botany at King's College, London; in 1852 professor of natural history at the School of Mines, and president of the Geological Society; in 1853 professor at Edinburgh. He was a brilliant and voluminous writer. Important among his works are *History of British Starfishes* (1841); *History of British Mollusca* (with Hanley, 1853). Consult Wilson and Geikie, *Memoir of Edward Forbes* (Edinburgh, 1861).

FORBES, EDWIN (1839-95). An American artist, born in New York, and a pupil of A. F. Tait. He was special artist for *Frank Leslie's Magazine* during the Civil War, and the etchings he did at this time were given by General Sherman to the Government, and are now in the War Office at Washington. They are of historic value. Afterwards he painted landscape and cattle scenes, among which are "Orange County Pasture" (1879) and "Evening—Sheep Pasture" (1881). In 1877 he was made an honorary member of the London Etching Club.

FORBES, GEORGE, Earl of Granard (1685-1765). See GRANARD.

FORBES, HENRY OGG (1851—). A Scotch traveler, born at Drumblade. In 1878-83 he made extensive scientific travels through Sumatra, Java, Timor, and other islands of the East Indies. In 1885 and 1886 he explored British New Guinea. He was elected a fellow of the Zoölogical Society of London and of the Royal Geographical Society, and appointed director of the Free Public Museums of Liverpool. He published *A Naturalist's Wanderings in the Eastern Archipelago: A Narrative of Exploration and Travel from 1878 to 1883* (1885).

FORBES, JAMES DAVID (1809-68). A Scotch physicist and geologist. He was educated at the University of Edinburgh with a view to the law, but his natural inclinations led him to the study of physics. At the age of nineteen he was elected to membership in the Royal Society of Edinburgh, and five years later succeeded Sir John Leslie as professor of natural philosophy in the university, although opposed by Sir David Brewster. His studies on thermal radiations resulted in the important discovery of the polarization of heat, for which the Royal Society of London awarded him the Rumford medal. While traveling in the Alps, Forbes collected a vast amount of information bearing on the origin and movement of glaciers, and his book, which appeared in 1843, was the most valuable contribution on glacial phenomena that had been published up to that time. His investigations were limited to the collection and arrangement of reliable data, but they were the means of overthrowing many crude conceptions and of directing future studies in the proper channels. Forbes received the degree of LL.D. from the University of Edinburgh, and was elected to membership in the Royal Society of London, the Geological Society, and many foreign scientific societies, including the Institute of France. He contributed a great number of scientific papers to the *Proceedings* of the Royal Society of Edinburgh. His more extended publications are: *Travels Through the Alps of Savoy and Other Parts of the Pennine Chain, with Observations on the Phenomena of Glaciers* (1843); *Norway, and Glaciers Visited in 1851* (1853); and *A Tour of Mont Blanc and Monte Rosa* (1855).

FORBES, JOHN (1710-59). A Scotch soldier, who served in America during the French and Indian War. For some time he was a physician in Scotland, but subsequently entered the army, served in the War of the Austrian Succession, became a colonel in 1757, and served for a time as quartermaster-general under the Duke of Cumberland. In December, 1757, he was sent to America as brigadier-general for service against the French and Indians, accompanied the Louisburg expedition as adjutant-general early in 1758, and in the summer of that year led the force of between six and seven thousand, which marched across Pennsylvania, and on November 25 took possession of Fort Duquesne, which had been evacuated by the French on the preceding day. In March, 1759, Forbes, who had been dangerously ill through the expedition, died in Philadelphia. Consult Parkman, *Montcalm and Wolfe* (Boston, 1884).

FORBES, JOHN MURRAY (1807-85). An American clergyman. He was born in New York, and graduated at Columbia College in 1827, and at the General Theological Seminary in 1830. He was ordained to the Episcopal ministry in the same year, and in 1834 became rector of Saint Luke's Church, New York, also acting for a time as professor of pastoral theology in the seminary. In 1849 he became a Roman Catholic, and after reordination was appointed pastor at Saint Ann's Church, New York, where (having been married before his conversion) he presented the unique spectacle of a Catholic priest attended at the altar by his sons. In 1859 he returned to the Episcopal Church, and from 1869 to 1872 was dean of the General Theological Seminary.

FORBES, Sir JOHN (1787-1861). A Scotch physician, born at Cuttlebrae, Banffshire. He studied at Aberdeen from 1805 to 1807, and from the latter year to 1816 acted as assistant surgeon in the navy. In 1817 he graduated in medicine at Edinburgh, then practiced his profession at Penzance and Chichester until 1840, when he removed to London. He was for years physician to the Queen and Prince Consort, and was knighted in 1853. He was a fellow of the College of Physicians and the Royal Society of London, and a member of numerous foreign societies. Jointly with Drs. Tweedie and Conolly, he edited the *Cyclopædia of Practical Medicine* (4 vols., 1832-35). In 1836 he founded the *British and Foreign Medical Review*, which he carried on for twelve years. In 1831 he published the first edition of his translation of *Lænnec's Treatise on Auscultation* (5th ed. 1838). Among his other works are: *Physician's Holiday* (1849); *Memoranda Made in Ireland* (1852); *Sightseeing in Germany and the Tyrol* (1856); *Nature and Art in the Cure of Diseases* (1857).

FORBES, John Colin (1846—). A Canadian artist, born at Toronto. He was already proficient in his art before he went to London, where he studied at the Royal Academy, and afterwards in Europe. He settled in New York City. Among his works are the "Mount of the Holy Cross"; "The Foundering of the *Hibernian*"; "The Glacier of the Selkirk," and many portraits, including those of the Marquis of Dufferin, Gladstone, Sir Charles Tupper, and Sir John MacDonald.

FORBES, Stanhope A. (1857—). An English genre painter, born in Dublin. He studied under Bonnat in Paris, and in 1889 received a first-class medal at the Paris Exposition. Among his works exhibited at the Royal Academy are: "The Fish Sale"; "By Order of the Court"; "Forging the Anchor"; and "The Village Philharmonic Society," bought by the Corporation of Birmingham. He is noted for his interior effects, which show much cleverness in the treatment of light.

FORBES, Sir William, of Pitsligo (1739-1806). A Scottish banker and writer, born at Edinburgh. He was educated at Aberdeen. In 1761 he was admitted as a partner in the bank at Edinburgh of Messrs. John Coutts & Co.; and two years later a new company was formed, of which he ultimately became the head. In 1781 he purchased the estate of Pitsligo, Aberdeenshire, which had been forfeited by Lord Forbes of Pitsligo for taking part in the Rebellion of 1745. He introduced the most extensive improvements on it, and laid out and built the village of New Pitsligo. He was a member, with Johnson, Burke, Garrick, Reynolds, and others, of the celebrated Literary Club of London, was a friend of Dr. Beattie, the poet, and published *An Account of the Life and Writings of James Beattie, including many of his Original Letters* (2 vols. 1806). He also wrote the *Memoirs of a Banking House* (1803). His bank became, in 1838, the Union Bank of Scotland.

FORBES-ROB′ERTSON, Johnston (1853—). An English actor, born in London. He early won some success as a painter, but went upon the stage when he was twenty-one years old, and has since been a member of various companies, including those of Sir Henry Irving and Sir Squire Bancroft. Some of his best-known performances have been those with Mrs. Patrick Campbell, in *The Notorious Mrs. Ebbsmith*, at the Garrick in 1895, and a little later as Romeo to her Juliet, at the Lyceum, where he assumed the management late in that year; as Constantine in Coppée's *For the Crown* (1896); and in 1897 as Hamlet, his best Shakespearean part.

FORBIDDEN FRUIT. A name fancifully given to the fruit of different species of the genus Citrus. In the shops of Great Britain, a small variety of the shaddock generally receives this name. But on the Continent of Europe a different fruit, regarded by some as a variety of the orange, and by some as a distinct species (*Citrus decumana*), is known as the forbidden fruit, or Adam's apple. The name forbidden fruit has also been given to the fruit of Tabernæmontana dichotoma, a tree of Ceylon, of the order Apocynaceæ. The shape of the fruit, which is a follicle, containing pulp, suggests the idea of a piece having been bitten off, and the legend runs that it was good before Eve ate of it, although it has been poisonous ever since. See Pomelo; Shaddock; Citrus.

FORBIGER, fôr′bĭg-ẽr, Albert (1798-1878). A German philologist, born in Leipzig. He studied at the University of Leipzig, in 1824 was appointed an instructor in the Nikolaischule in that city, and in 1835 became its associate rector. His publications include an edition of *Vergil* (4th ed. 1872-75); *Handbuch der alten Geographie* (1842-43), a translation into German of Strabo (1856-62); and *Hellas und Rom* (1871-82), with A. Winckler.

FORBIN, fôr′băN′, Claude, Count de (1656-1733). A French mariner, born at Gardanne (Provence). After a wild boyhood he entered the navy and distinguished himself by reckless bravery in the campaigns of Messina (1675), the Antilles (1680), and Algeria (1682-83). He was sent to Siam as Ambassador in 1685, and so pleased the King of that country that he made him his grand admiral. In 1689 Forbin returned to France, and under Jean Bart fought against England, and was taken prisoner. From 1690 to 1707 Forbin was very active. He fought at The Hague and Lagos, and at the taking of Barcelona, and afterwards captured numerous English and Dutch vessels as commander of the French fleet (1707). A year later he was in command of an expedition to conduct the Pretender to Scotland, but failed, as the coast was too well guarded. After this Forbin retired from active life and lived at Marseilles, where he wrote his entertaining *Mémoires*, which were edited by Reboulet, and first published in 1729.

FORBONNAIS, fôr′bô-nâ′, François Véron Duverger de (1722-1800). A French political economist, born at Le Mans (Sarthe). After study of business methods at Nantes, and travel in Italy and Spain, he was appointed inspector-general of the Mint in 1756, and in 1759 the head of the office of Silhouette, Comptroller-General of the Finances. His advice was frequently sought by the Constituent Assembly of 1790, in connection with the reform of the monetary system. He was elected a member of the Institute of France in 1794. He wrote extensively on economic questions. He was possessed of judgment of a high order and clear style, and his works not only influenced the administration of his day, but are still regarded as valuable. These include *Eléments du commerce* (2 vols., 1754); *Recherches et considérations sur les finances de France depuis 1595 jusqu'en 1721* (1758); and *Principes et observations économiques* (1767). Consult Delisle de Sales, *Vie littéraire de Forbonnais* (Paris, 1801).

FORCE (Fr. *force*, OSp., It. *forza*, from ML. *fortia*, force, from Lat. *fortis*, strong; connected with Skt. *bṛhan*, high). If the motion of a body is observed to be changing, that is, if it is observed to have an acceleration (q.v.), it is said to be under the 'action of a force.' As illustrations, changes in motion are observed if a heavy body is allowed to drop from the hand, if a piece of iron is brought near a magnet, if a piece of paper or dust is brought near an electrified body, etc.; and, therefore, one speaks of the 'force of gravitation,' 'magnetic force,' 'electric force,' etc. In every case, however, when there is a change in the motion of a body, it may be shown that this change is in some way due to the presence of some other body, e.g. the earth, the magnet, the charged body; and it is shown in mechanics (q.v.) that the proper measure of this influence on the body which receives the acceleration is the product of the numerical value of its mass, and the numerical value of the acceleration received. Thus, if a body whose mass is *m* grams is moving with an acceleration *a* (measured in centimeters and seconds), an 'external force' of *ma* dynes is said to be 'acting on it,' since in the C. G. S. system the dyne is the unit of force. This acceleration may. of course, be due to the simultaneous 'action' of several forces, each of which by itself would have produced a different acceleration. In particular, if there is no acceleration, this does not necessarily mean an absence of external action; but may mean that there are two forces acting in opposite directions which are numerically equal. There are two general methods for measuring forces. One is to measure the mass and the acceleration; the other is to balance the force by one whose value is known. Thus, as all bodies fall toward the earth at any one place on the earth with the same acceleration when allowed to fall *freely*, viz. with an acceleration which may be called '*g*' and which nearly equals 980, the force of the earth on a body, whose mass is *m* grams, i.e. its 'weight' is *mg*. Consequently, if this body is kept from falling by being suspended by a cord, the cord must exert on the body an *upward* force whose numerical value is *mg*. If, therefore, it is required to apply a force F in a particular direction, it is simply necessary to attach a body whose mass *m* equals F/*g* to one end of a cord, pass the cord over a pulley (q.v.), and attach its other end to the body on which the force F is to act, in such a manner that the cord pulls in the specified direction. Similarly, if any force can be neutralized by the weight of a body of mass *m* this force must have the numerical value *mg* dynes. In this way 'magnetic' or 'electric' forces can be measured.

The 'field of force' of a body is the region through which it is possible to detect the action of forces on other bodies due to its presence. Thus, the field of force of gravitation of the earth extends far beyond the moon out into celestial space; the field of magnetic force of the earth also extends far out into space—how far, it is not known; the field of electric force due to a charged body is in general a limited region quite near it. The 'direction of the field' at any point is that in which a specified particle of matter placed at that point would move under the action of the given kind of force, if allowed to move freely. Thus, the direction of the field of gravitational force around the earth is always vertically toward the centre of the earth; the direction of a magnetic field of force is that in which the north pole of a minute magnet would move; the direction of an electric field of force is that in which a particle of matter positively charged would move. The subject of force plays an important part in all conditions involving physical measurements, and for a further discussion of the matter the student of physics is referred to one of the modern treatises on physics. Consult: Everett, *Centimetre-Gramme-Second System* (London, 1875; and Daniell, *Text-Book of the Principles of Physics* (New York, 1894).

FORCE, Manning Ferguson (1824-99). An American soldier, writer, and lawyer, the son of Peter Force (q.v.). He was born in Washington, D. C., and graduated at Harvard College in 1845, and at the Harvard Law School. On the outbreak of the Civil War he entered the Federal Army as major of the Twentieth Ohio Volunteers; at the close of the war was brevetted major-general of volunteers. Refusing a colonelcy in the Regular Army, he resigned from the service, and subsequently was Judge of the Court of Common Pleas of Hamilton County, Ohio (1867-77); Judge of the Superior Court of Cincinnati (1877-87), and commandant for many years of the Ohio Soldiers' Home. He published: *From Fort Henry to Corinth* (1881); *Marching Across Carolina* (1883); *Personal Recollections of the Vicksburg Campaign* (1885); *Life of Justice John McLean*, and *Some Early Notices of the Indians of Ohio; and To What Race Did the Moundbuilders Belong?* (1879). He also edited Walker's *Introduction to American Law* (1878), and Harris's *Principles of Criminal Law* (1880). He began the preparation of the biography of General Sherman (1899), in the "Great Commanders Series," but failing health forced him to give up the task.

FORCE, Peter (1790-1868). An American scholar and historian, born at Passaic Falls, N. J. He learned and worked at the printer's trade in New York City, removed to Washington in 1815, and in 1820-36 published the *National Calendar*, a statistical annual. From 1823 to 1830 he was proprietor and editor of the *National Journal*, the official newspaper of the John Quincy Adams Administration. He was Mayor of the city of Washington in 1836-40. and in the latter year was elected the first president of the National Institute for the Promotion of Science. In 1836-46 he published a valuable series of *Tracts and Other Papers Relating to the Origin, Settlement, and Progress of the Colonies in North America, from the Discovery of the Country to the Year 1776* (4 vols.). But he is best known for his *American Archives*, a documentary history of the English colonies in North America. published at the expense of the Government under an act of Congress of 1833. Nine volumes. covering the period from 1765 to 1776, appeared in 1847-53, but the work was then discontinued owing to the refusal of Marcy, Secretary of State, to approve further volumes. Force's unique library, including 30,000 pamphlets and more than 20,000 volumes, and consisting principally of Americana, of which he was the earliest important collector, was purchased by the Government in 1867 for $100,000, and incorporated with the Library of Congress. Force was also regarded as an authority on the literature of Arctic discovery. His further publications were *Grinnell Land* (1852), and *Record of Auroral Phenomena Observed in Higher Northern Latitudes* (1856).

FORCE BILL. In American political history, the name applied to several bills passed by the United States Congress. See Nullification; Reconstruction; Ku-Klux Klan.

FORCE DE CHEVAL, fôrs de she-vȧl′ (Fr., horse-power). A French unit of power equal to 736 watts (q.v.), and corresponding to the English 'horse-power,' which is equivalent to 746 watts. It is the rate of work or activity equivalent to 75 kilogrammeters per second. See Mechanical Units.

FORCED MARRIAGE, The. (1) A tragicomedy by Mrs. Aphra Behn, produced at the Duke's Theatre in 1671. Its first performance is remarkable from the appearance of Otway in the rôle of the King. His ill success in the part made this his only appearance on the stage. (2) A tragedy by John Armstrong, written in 1754, but not published until 1770.

FORCELLINI, fôr′chĕl-lē′nê, Egidio (1688-1768). An Italian philologist. He was born on August 26, 1688, in a village near Padua. Owing to the limited means of his family, Forcellini was deprived of early instruction, and was already verging toward manhood when enabled to commence a regular course of study in the seminary at Padua. His industry, combined with his powers of learning, won the admiration of the principal, Giacomo Facciolati, who associated him with some of his own scientific labors. The pupil rendered his teacher valuable service in the compilation of a highly important lexicon, a work which probably inspired both with the project on which Forcellini's literary repute is based —the compilation of a comprehensive vocabulary of the Latin language. The work was published after Forcellini's death, and was one of the most valuable acquisitions to philological science of the age. In addition to the Italian and Greek signification of the Latin word, the literal and figurative application of each expression is given in a collection of examples, embracing the customs, laws, arts, sciences, religion, and history of the Romans. So full are the citations that it has been said that, if the whole body of extant Latin literature were destroyed, it could be in great part recovered from the quotations given in this lexicon. The work was published in four volumes, folio, under the title *Totius Latinitatis Lexicon, Consilio et Cura Jac. Facciolati, Opera et Studio Æg. Forcellini Lucubratum* (1771). The last edition, with an Onomasticon, was published by De Vit (Prato, 1858-60). Forcellini died in Padua, April 4, 1768.

FORCEPS (Lat., pincers). The name given by surgeons to an instrument of great antiquity, used as a substitute for the fingers, and consisting of two levers of metal jointed together crosswise, usually nearer to one end than the other. The hand grasping the longer ends of the levers or handles, closes the shorter ends, which are shaped so as to seize firmly the intended object. There is scarcely a surgical operation in which it is not applied. The variety is almost innumerable. In addition to the forms used in dentistry, there are in common use the *dissecting* forceps, which has roughened points, to lay hold of small portions of tissue which are to be divided by the knife; the *lithotomy* forceps, which has blades concave like spoons, while other forms of this forceps are adapted for seizing stones of various shapes and sizes; and *artery* forceps, with locks for seizing and holding the extremities of bleeding vessels. By means of Liston's *cutting* forceps, a powerful hand can divide a great thickness of bone. One of the most important of all forceps is the *obstetric* forceps, an invaluable invention in cases of difficult delivery. It consists of two concave fenestrated blades, forming a cavity into which the head of the child fits. The blades are applied separately, one to each side of the head, and then locked together. Holding by the handles, the accoucheur aids the natural efforts of labor. The instrument does not necessarily or generally injure either mother or child.

FORCHHAMMER, fôrk′hȧm-mẽr, Johann Georg (1794-1865). A Danish geologist. He was born in Husum, Schleswig, studied at Kiel and Copenhagen, and was associated with Oersted and Esmarch in a mineralogical exploration of Bornholm. In 1831 he became professor of mineralogy in the university and curator of the geological museum at Copenhagen. He succeeded Oersted in 1851 as director of the Polytechnic School and secretary of the Academy of Sciences. His researches (jointly with Steenstrup and Worsaae) on the prehistoric anthropology of the north of Europe, have yielded results of great importance. Among his publications are: *Krystallographie* (1833); *Danmarks geognostiske Forhold* (1835); and *Bidrag til Skildringen af Danmarks geographiske Forhold* (1837).

FORCHHAMMER, Peter Wilhelm (1801-94). A German classical archæologist and mythologist, brother of Johann Georg Forchhammer. He was born at Husum, Schleswig, and studied at the University of Kiel, where he became professor extraordinary in 1836. In 1830 he visited Italy and Greece, and in 1838 undertook a second journey to Greece, Asia Minor, Egypt, and Rome, which bore fruit in valuable contributions to the topography of ancient Hellas and the Greek settlement in Asia. Among these works were *Hellenika* (1837) and *Ueber die Reinheit der Baukunst* (1856), in which he traced the four styles of Greek architecture to climatic conditions and differences in materials. He also wrote treatises on the philosophy of Aristotle and on the archæology and mythology of Greece. In his works on the latter subject he invariably regarded the Hellenic myths as personified embodiments of natural, and especially aquatic, phenomena. Among these publications mention should be made of his *Achill* (1853); *Daduchos* (1875); *Die Wanderungen der Inachostochter Io* (1881); *Erklärung der Ilias auf Grund der topischen und physischen Eigentümlichkeiten der troischen Ebene* (1884); *Prolegomena zur Mythologie als Wissenschaft und Lexikon der Mythensprache* (1891); and *Homer: Seine Sprache, die Kampfplätze seiner Heroen und Götter in der Troas* (1893). His early work, *Die Athener und Sokrates* (1837), contained many original ideas that were at first ridiculed, but afterwards were accepted by prominent historians. Forchhammer sat in the Prussian Diet from 1868 to 1870, and from 1871 to 1873 was a member of the German Reichstag.

FORCHHEIM, fôrk′hīm. A town in Upper Franconia, Bavaria, near the junction of the Wiesent with the Regnitz, on the Ludwigskanal, 16 miles south-southeast of Bamberg (Map: Germany, D 4). It has a castle and a Gothic church. Its manufactured products include machinery, cloth, and paper. Forchheim was an important town in the days of Charlemagne, and in the ninth and tenth centuries was the meeting-place of many royal diets. From 1007 to 1802 it was held by the bishops of Bamberg, except during an interval of about thirty years. In its vicinity the French, on August 7, 1796, gained a victory over the Austrians. Population, in 1900, 7590.

FORCIBLE ENTRY AND DETAINER. The taking or keeping possession of real property through threats or force, with no authority of law. To make such forcible entry there must be such acts of violence, menaces, or gestures as may give reason to anticipate personal injury or danger in making a defense. But the force must be more than is implied in mere trespass. There are in most of the States statutes regulating proceedings in cases of forcible entry, directing the manner of proceeding for the restoration of property unlawfully withheld and the punishment of the offender. The plea of ownership is not a justification of the defendant, for no one may enter even upon his own property in any other than a peaceable manner. Nor can he be excused on the plea that he entered to enforce a lawful claim or make a distress, nor on the plea that possession was finally obtained by entreaty. The policy of this legislation is to prevent the disturbance of the public peace, and to compel disputants to settle their controversy in a court of justice.

Originally by the common law of England the right of entry upon land of which one had been unlawfully deprived might be exercised by force or threats, if necessary. But by a series of early statutes, the first of which dates back to the time of Richard II., this remedy was limited to an entry "in a peaceable and easy manner, and not with force or strong hand." See Entry, Right of.

FORCING (in horticulture). The acceleration of vegetation by application of artificial heat. The term is not usually applied to the cultivation of exotic plants in hothouses, where the object is to imitate as much as possible their native climate; but it is strictly applicable to the system usually pursued with grapes, pineapples, tomatoes, and other plants, to secure the production of fruit at desired seasons, and by different plants of the same kind in succession through a considerable period; the heat being increased for one set of plants sooner than for another. Many of the fruits and vegetables which grow well in the open air are very commonly forced, in order that they may be procured out of their natural season. Thus, rhubarb is forced by means of the heat produced by heaps of fermenting manure. Asparagus, salads, radishes, lettuce, onions, etc., are often forced by means of hotbeds, or in flued pits, or a place is found for them in hothouses. Strawberries are treated in the same way. See Hotbed; Hothouse.

FORCKENBECK, fôrk′en-bĕk, Max von (1821-92). A German Liberal politician, born at Münster, Westphalia. In 1858 he was elected a member of the Prussian House of Representatives; in 1862 became a founder of the organization styled the 'Fortschrittspartei,' or 'Party of Progress,' and in 1866 of the National Liberal Party. He was elected president of the House in 1866. From 1867 until his death, except for the period from 1887 to 1890, he was a member of the Reichstag, and from 1874 to 1879 its president. He sat in the Prussian House of Peers from 1873, as chief burgomaster of Breslau, and from 1878 until his death he was chief burgomaster of Berlin. He displayed considerable ability as a party leader and presiding officer.

FORD, Edward Onslow (1852-1901). An English sculptor, born in London. He studied in 1870 at the Antwerp Royal Academy, in 1871-72 at the Munich Royal Academy, became an associate of the Royal Academy in 1888, and a Royal Academician in 1895. He was also elected a corresponding member of the Institute of France. His more important works include statues of Sir Rowland Hill (1882), at the Royal Exchange, selected in open competition by the committee of the Corporation of London; of Gladstone (1883), at the City Liberal Club, London; of Sir Henry Irving as Hamlet (1885); and of C. G. Gordon ('Chinese' Gordon) (1890), at Chatham. Others are the Marlowe Memorial at Canterbury; the Shelley Memorial at University College, Oxford; and a statue of Huxley (1900), at the British Museum of Natural History.

FORD, Emanuel. An Elizabethan romancer. He was the author of *Parismus*, in two parts (1598-99), long exceedingly popular, and of the similar romances, *Ornatus and Artesia* (1607) and *Montelion* (1633, but probably published earlier).

FORD, Sir Francis Clare (1828-99). An English diplomat. He was commissioned a lieutenant in the Fourth Light Dragoons, but left the army in 1851, entered the diplomatic service, and became secretary of legation at Washington, where he was acting chargé d'affaires in 1867-68. In 1871 he was appointed secretary of embassy at Saint Petersburg, and in 1872 was transferred to Vienna. He represented the British Government in 1897 at Halifax before the International Commission, by decision of which a sum of $5,500,000 was awarded to Great Britain as compensation for superior advantages obtained by the United States in the Washington fisheries treaty of 1871. From 1878 to 1879 he was Envoy Extraordinary and Minister Plenipotentiary to the Argentine Republic, and during a portion of the time to Uruguay also. He was afterwards appointed to similar posts at Rio de Janeiro and at Athens; in 1884 became Minister (from 1887 Ambassador) to Spain; in 1892 was transferred to Constantinople, and in 1893 to Rome. His services to British diplomacy won for him frequent official recognition, including appointment to the Privy Council in 1888.

FORD, John (1586-?). An English dramatist, son of Thomas Ford, of Ilsington, Devonshire. After studying for about a year at Exeter College, Oxford, he was admitted a member of the Middle Temple (November, 1602). His first publication was an elegy on the Earl of Devonshire, entitled *Fame's Memorial* (1606), to which was prefixed a dedicatory sonnet to Lady Penelope, Countess of Devonshire, the Stella of Sidney's verse. This was followed the same year by *Honor Triumphant*. His dramatic career began in 1613, when his play *An Ill Beginning Has a Good End* was produced at the Cockpit. Thereafter he wrote many plays (e.g. *The Bristowe Merchant*, tragedy, 1624), single-handed or in collaboration with Dekker, Rowley, and Webster. His two most powerful tragedies are *'Tis Pity She's a Whore* (1633) and *The Broken Heart* (1633). After 1639 nothing more is heard of him. Ford belongs to a group of Jacobean dramatists who wrote for an audience demanding sensation, complicated plots, and strong motives.

Pathos he exaggerated for dramatic effect. Nevertheless, his tragedies contain some of the greatest scenes after Shakespeare. In comedy he was weak. His *Dramatic Works,* with those of Massinger, were edited by Hartley Coleridge (new ed. London, 1883), and an edition of *Plays,* selected, by Ellis, appeared in the "Mermaid Series" (London, 1888).

FORD, John Thomson (1829-94). An American theatrical manager, born at Baltimore. He became manager of the Holliday Street Theatre in Baltimore, where he was elected president of the Municipal Council (1858), and was Acting Mayor for two years. At Washington, D. C., he built three theatres, one of which was that known as Ford's Theatre, the scene of the assassination of President Lincoln by Booth on April 14, 1865. On suspicion of complicity in connection with the deed, he was arrested and imprisoned for forty days. He was then released, inasmuch as absolutely no evidence was adduced against him. In 1871 he built Ford's Grand Opera House at Baltimore. He was long one of the board of governors of the Maryland Penitentiary, and at one time president of the board of directors of the Baltimore and Ohio Railway.

FORD, Master. In Shakespeare's *Merry Wives of Windsor,* a jealous husband, to whom, under the name of Master Brook, Falstaff relates the course of his attempted wooing of Mrs. Ford.

FORD, Paul Leicester (1865-1902). An American historian and novelist, born in Brooklyn, L. I. He was privately educated, and after wide travels in both hemispheres he devoted himself to investigations in the sources of American history, and edited the *Writings of Thomas Jefferson,* in ten volumes (1892); the *Writings of Thomas Dickinson* (2 vols.); *The Federalist* (1886), etc. These studies led to *The True George Washington* (1896); *The Many-Sided Franklin* (1899); and *The New England Primer,* with many minor writings of like character. To fiction he contributed: *The Honorable Peter Sterling* (1894); *The Great K. & A. Train Robbery* (1897); *The Story of an Untold Love* (1897); *Tattle Tales of Cupid* (1898); a collection of short stories; *Janice Meredith* (1899); *Wanted: A Matchmaker* (1901); and *Wanted: A Chaperon* (1902). Mr. Ford also did valuable work in the *Bibliographer,* which he founded, and of which he was editor at the time of his death.

FORD, Richard (1796-1858). An English writer. He graduated at Trinity College, Oxford, in 1817, and was afterwards called to the bar, but never practiced. He spent four years traveling in Spain, and in 1845 published his delightful *Handbook for Travelers in Spain.* A second edition was smaller in bulk, and the material left out was published in *Gatherings from Spain* (1846). Ford also contributed important papers on Spanish art to the *Quarterly Review* and other periodicals. In 1837 he published a pamphlet entitled *Historical Inquiry into the Unchangeable Character of a War with Spain.*

FORD, Worthington Chauncey (1858—). An American author and statistician, born and educated in Brooklyn, N. Y. After several years spent in the publishing and newspaper business, he was appointed, in 1885, chief of the Bureau of Statistics of the Department of State in Washington, continuing in that position until 1891. From 1893 to 1898 he was chief statistician of the Treasury Department, and in the latter year became connected with the Boston Public Library. In 1902 he was also appointed expert accountant to the municipal government of New York City. He wrote *The American Citizen's Manual* (1883); *The Standard Silver Dollar* (1884); *George Washington* (1901), and numerous monographs and pamphlets on historical, biographical, and economic subjects. He revised David A. Wells's *Natural Philosophy* (1879), and edited the *Correspondence and Journals of Samuel Blachley Webb* (1893-94) and *The Writings of George Washington* (1889-91), his most important work.

FORD'HAM. Formerly a village in Westchester County, N. Y., but since 1874 a part of New York City, being now included in the Borough of the Bronx. Saint John's College, a Jesuit institution, is situated here (Map: Greater New York, D 2). Originally, along with Yonkers, in the possession of Adrian Vander Donck, Fordham was erected into a manor in 1671, and became a separate parish in 1850.

FORDIL'LA (Neo-Lat., named in honor of the discoverer, S. W. Ford). A small bivalve shell found in the limestones of Lower Cambrian age of Rensselaer and Columbia counties, New York, and supposed to be the oldest known pelecypod or clam-shell. See Cambrian System; Pelecypoda.

FORD'S THEATRE. A Washington theatre, in which President Lincoln was assassinated by Booth, April 14, 1865. The building was purchased in 1866 by the United States Government, and was used until 1887 as the Army Medical Museum, and later as the Pension and Records Bureau of the War Department. It collapsed, with the loss of many lives, on June 9, 1893.

FORDUN', John of (?-c.1384). A Scottish historical writer. He was probably a chantry priest in the Cathedral of Aberdeen. He is said to have traveled on foot through Britain and Ireland in search of materials for a chronicle of Scotland, which he had set himself to compile. This was probably between 1363 and 1384. He died probably in 1384, or a little later. Of his *Chronica Gentis Scotorum* he wrote five books, extending to 1353, and a part of Book VI., which deals with English history. His *Gesta Annalia* extend from 1353 to 1383. The work which John of Fordun left unfinished was continued by Walter Bower (q.v.). Fordun's chronicle is the chief authority for the history of Scotland prior to the fifteenth century, its value being greatest for the fourteenth, where it is contemporary. Four printed editions have been published, of which the best is that by Skene (Edinburgh, 1871-72), from the text of the Wolfenbüttel and other standard manuscripts. Bower's interpolations and additions are separated from Fordun's text.

FORECAST, Weather. See Meteorology; Weather Bureau.

FORECLOSURE. The legal process whereby a mortgagor's right, or 'equity,' of redemption is cut off and the mortgagee's lien on the mortgaged lands or goods enforced. In order to put a limit on the 'equity of redemption' of the mortgagor (see Equity of Redemption) the remedy of foreclosure was devised by the Court of Chancery. It is available to the mortgagee at any time after default, and is instituted by a bill of foreclosure praying that an account may be taken of the principal and interest due under the mortgage, and that the mortgagor, on failing to pay by a specified date, may forfeit his equity of redemption. If on the day fixed for payment the money be not forthcoming, the mortgagor will be declared to have forfeited his equity of redemption, and the mortgagee will be allowed to retain the estate in perpetuity. This method of enforcing the security of the mortgagee of lands is still in use in England and in many of the United States.

In a few of the American States, however, in which the mortgage has come to be regarded as a mere lien, and not as a legal estate in the mortgagee, a statutory process, known also as a foreclosure, has been adopted in lieu of the foregoing process of 'strict' foreclosure. This differs from the older method principally in the fact that it involves the satisfaction of the debt, not by a forfeiture, but by a sale of the mortgaged premises. The suit, which is also in equity, is instituted by the mortgagee as plaintiff, the mortgagor and all creditors, subsequent lienors, and other parties in interest, being made defendants. The demand is for a judgment that the defendants be foreclosed and cut off from all their interest in the mortgaged premises, and that the same be sold to satisfy the mortgage debt. The sale is made upon notice, and is at public auction, generally by the sheriff or a referee appointed by the court. After the sale the money in the hands of the referee will be applied to the payment of the mortgage, and any surplus may be claimed by subsequent mortgagees; or, if there is no other claim upon it, it will be paid to the mortgagor. Other methods of effecting a foreclosure, by legal rather than equitable process, as by a writ of entry or of ejectment directed by the mortgagee against the mortgagor, also occur in a few States. See Equity of Redemption; Mortgage; and the authorities there referred to.

FOREIGN ATTACHMENT. A process which a few local courts of England have authority, by immemorial custom, to issue. The custom of the Mayor's Court of London is that when a foreigner defendant, of whom the court has jurisdiction, does not appear in response to a summons served on him, the plaintiff may attach his goods or debts due to him as security to enforce his appearance. Recent decisions of the House of Lords have so narrowed the custom and have pointed out so many difficulties of procedure under it that it has fallen into disuse. In this country the attachment or garnishment of the goods or debts of non-residents is regulated by statutes in the several States. See Attachment; Garnishment; and the authorities there referred to.

FOREIGN JUDGMENT. The judgment of a tribunal in a jurisdiction independent of that in which it is sought to be enforced. The effect to be given to such a judgment depends either upon treaty or the comity of nations. A government is not bound to enforce a judgment rendered in another country, nor even to recognize its existence, unless it has agreed to do so. As a matter of courtesy, however, toward sister States, as well as from considerations of convenience to suitors, each civilized nation is accustomed to treat a foreign judgment as conclusive upon the parties thereto concerning the matters decided by it, unless it is shown that the judgment was obtained by fraud, or that the court granting it did not have jurisdiction.

The States of the United States are foreign to each other so far as their judicial systems are concerned. They are subject, however, to the Federal Constitution, which declares that "full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State. And the Congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof." (Art. IV., Sec. 1.) This does not mean that a judgment obtained in one State can be enforced by an *execution* issued in another State. It only means that if an action is brought upon such judgment in another State, or if the judgment is pleaded there in bar to an action brought for the same cause, it shall receive the same credit that it would receive in similar circumstances in the State where it was rendered.

By common law a foreign judgment is proved by an exemplified copy under the great seal of the State, or by a true copy proved to be such by a witness who compared it with the original, or by the proper certificate of an officer duly authorized by law. Special methods of proving such judgments are provided by statute in the various States. (See Divorce; Judgment.) Consult Freeman, *Treatise on the Law of Judgments* (4th ed., San Francisco, 1892).

FOREIGN LAW. The law of a foreign country. The law of a State is, under modern conditions, entirely without authority in any other country, though foreign States may, as a matter of international comity, recognize the validity of acts legally performed in other countries, and may even, under proper conditions, administer the rules and principles of foreign law in its own tribunals. As to the circumstances under which this will be done, see Conflict of Laws.

For judicial purposes the several States of the Union are foreign to each other, though the comity subsisting between them is of the strongest character and has led to an extraordinary development of the principle of the recognition of the validity of judicial acts of one State in another. See Foreign Judgment; Extradition.

The courts of a country do not take judicial notice of foreign laws, but, where they are in issue, require them to be proved as matters of fact. Foreign statutory law may be proved by duly certified copies of the statutes in question, or even by printed compilations issued by the authority of the State enacting them. Foreign customary, or unwritten, law, however, can be proved only by the sworn testimony of properly qualified experts, though it has been held in the United States that the law of a kindred system like that of England may be established for judicial purposes by the citation of reported cases and text-books of recognized authority. In general, the courts of the several United States will take judicial notice of the laws of sister States, though in some of the States proof of the law of other States is required by the citation of reported cases, and the like. The Federal courts of the United States, however, even in matters in which they have no jurisdiction, will always take judicial notice of the laws of all the States. See Comity of Nations and International Law.

FOREIGN MONEY, Value of. For the purpose of fixing the rates at which the different foreign coins shall be computed for the purpose of determining the values of goods imported into the United States, it is made the duty of the Director of the Mint to publish from time to time the values of foreign coins. This was formerly

Value of Foreign Coins*

COUNTRY	Standard	Monetary unit	Value in terms of U. S. gold dollar	Coins
Argentine Republic	Gold	Peso	$0.965	Gold: argentine ($4.824) and ½ argentine. Silver: peso and divisions.
Austria-Hungary	Gold	Crown	.203	Gold: former system—4 florins ($1.929), 8 florins ($3.858), ducat ($2.287) and 4 ducats ($9.149). Silver: 1 and 2 florins. Gold: present system—20 crowns ($4.052); 10 crowns ($2.026).
Belgium	Gold	Franc	.193	Gold: 10 and 20 francs. Silver: 5 francs.
Bolivia	Silver	Boliviano	.384	Silver: boliviano and divisions.
Brazil	Gold	Milreis	.546	Gold: 5, 10, and 20 milreis. Silver: ½, 1, and 2 milreis.
British Possessions, N. A. (except Newf'nd)	Gold	Dollar	1.000	
Central Amer. States—				
Costa Rica	Gold	Colon	.465	Gold: 2, 5, 10, and 20 colons ($9.307). Silver: 5, 10, 25, and 50 centimos.
British Honduras	Gold	Dollar	1.000	
Guatemala Honduras Nicaragua Salvador	Silver	Peso	.384	Silver: peso and divisions.
Chile	Gold	Peso	.365	Gold: escudo ($1.825), doubloon ($3.650), and condor ($7.300). Silver: peso and divisions.
China	Silver	Tael — Amoy	.620	
		Canton	.619	
		Chi-fu	.593	
		Chin-kiang	.606	
		Fu-chow	.574	
		Haikwan (Customs)	.631	
		Hankow	.580	
		Hong Kong	(†)	
		Niu-chwang	.582	
		Ning-po	.596	
		Shanghai	.567	
		Swatow	.573	
		Tien-tsin	.601	
Colombia	Silver	Peso	.384	Gold: condor ($9.647) and double-condor. Silver: peso.
Cuba	Gold	Peso	.926	Gold: Doubloon Isabella, centen ($5.017). Alphonse ($4.823). Silver: peso.
Denmark	Gold	Crown	.268	Gold: 10 and 20 crowns.
Ecuador	Gold	Sucre	.487	Gold: 10 sucres ($4.8665). Silver: sucre and divisions.
Egypt	Gold	Pound (100 piasters)	4.943	Gold: pound (100 piasters), 5, 10, 20, and 50 piasters. Silver: 1, 2, 5, 10, and 20 piasters.
Finland	Gold	Mark	.193	Gold: 20 marks ($3.859), 10 marks ($1.93).
France	Gold	Franc	.193	Gold: 5, 10, 20, 50, and 100 francs. Silver: 5 francs.
German Empire	Gold	Mark	.238	Gold: 5, 10, and 20 marks.
Great Britain	Gold	Pound sterling	4.866½	Gold: sovereign (pound sterling) and ½ sovereign.
Greece	Gold	Drachma	.193	Gold: 5, 10, 20, 50, and 100 drachmas. Silver: 5 drachmas.
Haiti	Gold	Gourde	.965	Gold: 1, 2, 5, and 10 gourdes. Silver: gourde and divisions.
India	Gold	Pound sterling‡	4.866½	Gold: sovereign (pound sterling). Silver: rupee and divisions.
Italy	Gold	Lira	.193	Gold: 5, 10, 20, 50, and 100 lire. Silver: 5 lire.
Japan	Gold	Yen	.498	Gold: 5, 10, and 20 yen. Silver: 10, 20, and 50 sen.
Liberia	Gold	Dollar	1.000	
Mexico	Silver	Dollar	.417	Gold: dollar ($0.983), 2½, 5, 10, and 20 dollars. Silver: dollar (or peso) and divisions.
Netherlands	Gold	Florin	.402	Gold: 10 florins. Silver: ½, 1, and 2½ florins.
Newfoundland	Gold	Dollar	1.014	Gold: 2 dollars ($2.027).
Norway	Gold	Crown	.268	Gold: 10 and 20 crowns.
Persia	Silver	Kran	.071	Gold: ½, 1, and 2 tomans ($3.409). Silver: ¼, ½, 1, 2, and 5 krans.
Peru	Gold	Sol	.487	Gold: libra ($4.8665). Silver: sol and divisions.
Portugal	Gold	Milreis	1.080	Gold: 1, 2, 5, and 10 milreis.
Russia	Gold	Ruble	.515	Gold: imperial, 15 rubles ($7.718), and ½ imperial, 7½ rubles ($3.859). Silver: ¼, ½, and 1 ruble.
Spain	Gold	Peseta	.193	Gold: 25 pesetas. Silver: 5 pesetas.
Sweden	Gold	Crown	.268	Gold: 10 and 20 crowns.
Switzerland	Gold	Franc	.193	Gold: 5, 10, 20, 50, and 100 francs. Silver: 5 francs.
Turkey	Gold	Piaster	.044	Gold: 25, 50, 100, 250, and 500 piasters.
Uruguay	Gold	Peso	1.034	Gold: peso. Silver: peso and divisions.
Venezuela	Gold	Bolivar	.193	Gold: 5, 10, 20, 50, and 100 bolivars. Silver: 5 bolivars.

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* The coins of silver-standard countries are valued by their pure silver contents, at the average market price of silver for the three months preceding the date of this circular.

† The 'British dollar' has the same legal value as the Mexican dollar in Hong Kong, the Straits Settlements, and Labuan.

‡ The sovereign is the standard coin of India, but the rupee ($0.3244⅓) is the money of account, current at 15 to the sovereign.

done annually, but the fluctuating value of silver coins led in 1890 to a change in the law, requiring the statement to be made quarterly. Gold coins are reckoned by comparing the number of grains of fine gold which they contain with the amount of gold in the dollar. Silver coins are reckoned at the average value of the pure metal they contain during the three months prior to the determination of their value. When the values are determined by the Director of the Mint and proclaimed by the Secretary of the Treasury, they are valid in estimating the value of imports for the succeeding three months. The statement for October 1, 1902, is shown on the preceding page.

FOREIGN TRADE. See IMPORTS AND EXPORTS; FREE TRADE; TARIFF; BALANCE OF TRADE.

FOREIGN WARS, MILITARY ORDER OF. An hereditary patriotic society instituted in New York City in 1894, as the Military and Naval Order of the United States, but known under its present name since 1895. The objects of the order are to honor and preserve the names and memory of those who aided in maintaining the United States Government in the five foreign wars in which it has been engaged—namely, the War of the Revolution, the War with Tripoli, the War of 1812, the Mexican War, and the War with Spain—and to collect the records and documents relating to these wars. It admits to membership Veteran Companions, consisting of commissioned officers of the army, navy, and marine corps of the United States who participated in any of these foreign wars, and also Hereditary Companions, direct lineal descendants of commissioned officers in the main line. The national organization is made up of twenty-two State commanderies. The Order has a membership of over 1600 companions, among whom are many of the leading officers of the army and navy. This Order has been officially recognized by several European monarchs.

FOREKNOWLEDGE AND FOREORDINATION. Terms of theology, signifying God's knowledge of all things before they come to pass (foreknowledge); and the eternal purpose which finds its execution in time in the government of the history of man (foreordination). By some the divine foreknowledge and the divine foreordination are thought to have no dependence upon each other, pertaining to different spheres of the divine attributes and activity; by others foreordination, as respects the acts of free creatures, is thought to depend upon the foreknowledge of what those acts will be; or, again, foreknowledge to depend upon foreordination.

There are various theories of foreknowledge. (a) It is viewed simply as one of the divine perfections, absolute because the nature of God is infinite, and thus embracing all events whatsoever, including the volitions of free beings, but capable of no explanation except that it is a fact of the nature of God. Foreknowledge is no more of a mystery upon this view than any knowledge, or any other attribute of God. (b) A kindred view adds an element of explanation from the 'ideality of time.' There is no time to God, and hence foreknowledge, in the human sense of that word, does not exist. To know the future does not essentially differ from the knowledge of the present, for all the future is present to God. (c) Foreknowledge depends upon foreordination. God has in some sense foreordained all things, and what He foreordains He knows, not with an immediate vision, as is supposed by the previous theories, but by the knowledge of inference and imagination. (d) The foreknowledge of God is limited by the freedom of man, inasmuch as he cannot foreknow contingent volitions which are essentially uncertain. This is a voluntary self-limitation, since God has Himself given His creatures freedom. It involves no derogation from the greatness or the dignity of God. And it is only one example of the numerous limitations which He put upon Himself in the creation, and particularly in the redemption of man. (See KENOSIS.) This theory has been proposed at various periods in history, but has always met with rejection as militating against the infinity of God. It is, however, finding increased favor at the present day in many quarters.

The proofs of God's foreknowledge are derived from the perfection of God and from the Scriptures. Even men have a certain kind and degree of foreknowledge, which is absolutely essential to them in the regulation of life. If God were nothing more than an infinite man, He must have at least the same sort of foreknowledge, and in an infinite degree. This proof is reinforced by the Scriptures, which ascribe the most various and minute foreknowledge to God. Yet neither of these proofs goes so far as they have often been supposed to go. The foreknowledge ascribed to God in the Scriptures is very vast, as it must be in the nature of the case. But the Bible is not a metaphysical book, and leaves the question still unanswered whether there may not be some events, one perhaps in a hundred thousand, which God does not foreknow. In fact, many of the representations of Scripture, though often interpreted as anthropomorphisms, are in favor of a certain lack of knowledge of the future. Nothing in Scripture answers the question whether free volitions are in themselves subject to foreknowledge. Many are; for, though free in their essential nature, they are made in conformity with the balance of motives, and may be foreknown. This fact is the foundation of society. But, while volitions remain free, are there none that are unaccountable, against the balance of motives, and hence uncertain? That is the question of free will (q.v.); and it would be false exegesis which would rest its determination upon passages of Scripture.

Foreordination pertains to all events. So much is maintained by all theologians. Some teach that all events are embraced in foreordination in the same sense and way. This theory differs from fatalism because intended to be consistent with the freedom and responsibility of the creature; and it may be consistent if determinism (see FREE WILL) is consistent, as was maintained by Edwards and many others. Commonly a distinction has been made between foreordination and permission. The first sin of man is then said to have been permitted, and the lost are said not to have been 'reprobated,' but 'passed over' by electing grace; that is, left in the sinful state into which they have voluntarily brought themselves. Others, with more direct reference to free will and with a conception of the divine government as a moral government—that is, one through persuasives acting upon the will—have said that foreordination is the determination in the first instance as to what God will Himself do. From what He does, often follows immediately what men do, as in regeneration which leads to conversion, or when He does not do what would prevent sin. Thus He often indirectly foreordains what men shall do. This indirect foreordination will ultimately extend to the entire circumference of the government of God, and it will be in such a sense that it can be said that God foreordains 'whatsoever cometh to pass.' The divine government embraces all things even when it is in part a government of permission.

While the proofs of the divine foreordination are derived from the Scriptures, which are full of declarations as to what God will do, the proof is also rational. The proof of the existence of God involves in it the idea of plan (teleological argument), and plan is foreordination. Conceived as the plan of the world and of the history of man, foreordination may be interpreted by the actual course of events. Whatever may be said about speculative points, it is thus indubitable that God planned to create the world, to place man in it, to provide for his salvation when he had sinned, to lead Israel through all the crises of its history toward the moment when the Redeemer could be sent, to send the Redeemer, and to conduct the Church through those courses of revival and reformation when fallen into declension, by which its present degree of success has been attained. And as all this involves the existence of a chosen people, and this, again, the choice of individuals as its members, foreordination involves election (q.v.).

The grounds of this plan are to be found in the infinite wisdom and goodness of God. Whatever may be the success with which various schools have made this clear, such has been the meaning of all theologians. The most extreme schools of supralapsarians have believed that the lost were lost in consequence of their own sin, for which they were guilty, and which deserved in justice precisely the punishment they received; and they have also believed that justice must be done, and that neither wisdom nor goodness could permit it to go unsatisfied. The doctrine of election, which is but a corollary of foreordination, has often been regarded as a doctrine of favoritism. But theologians have never meant this by it. They have always founded it in the wisdom and goodness of God. They have often maintained that God elected every one who could be gained to righteousness by all the resources of His government. They have sometimes taught that more efforts were put forth for the finally lost than for some who were actually saved. The differences between the schools upon this doctrine have often been resolvable into this, that some referred a given fact to God, because it was under His government though by permission, while others ascribed it purely to man because done by him, though confessedly under a governmental permission.

The consistency of plan with free agency must be a real consistency under the divine government because it is real under human governments. A human governor can successfully determine to conquer a country under the conditions in which he is placed, and can successfully carry out his determination, as when Frederick the Great conquered Silesia. God can do the same. The attempts of philosophy to explain this consistency do not affect its reality, whether more or less successful. Consult: Mozley, *Treatment on the Augustinian Doctrine of Predestination* (London, 1855); McCabe, *The Foreknowledge of God and Cognate Themes* (New York, 1878). See FREE WILL.

FOREL, fō′rĕl′, AUGUSTE (1848—). A Swiss entomologist and psychologist. He was born at Morges (Canton of Waadt); studied at the universities of Zürich and Vienna, became a lecturer at Munich in 1876, and later held the chair of psychiatry at Zürich, from which he resigned in 1897. He was connected as assistant and director with various institutions for the insane. His publications include the prize essay *Les fourmis de la Suisse* (1874); *Der Hypnotismus* (1889; 4th ed. 1902); *Gehirn und Seele* (1894; 6th ed. 1899); and *Die psychischen Fähigkeiten der Ameisen und einiger anderen Insekten* (1901).

FOREL, FRANÇOIS ALPHONSE (1841—). A Swiss physician and naturalist, brother of the preceding, born at Morges (Canton of Waadt). After medical studies he was appointed professor of anatomy and physiology in the University of Lausanne. His studies concern the glaciers and lakes of Switzerland. His contributions to the natural history of the latter have appeared in *Le Léman* (1892-96), and in the *Handbuch der Seenkunde* (1901).

FORE′LAND, NORTH AND SOUTH. Two promontories on the east coast of Kent, England. NORTH FORELAND, the *Cantium* of Ptolemy, forms the northeast point of the county, and is in latitude 51° 22′ N., two miles east of Margate (Map: England, D 5). Its chalk cliffs, nearly 200 feet high, projecting into the North Sea, are crowned by a lighthouse, with a fixed light, 184 feet high visible 24 miles.—SOUTH FORELAND, also composed of chalk cliffs, 16 miles south of North Foreland and 3 miles northeast of Dover, has two fixed lights, respectively 380 and 275 feet above the sea, and visible about 25 miles (Map: England, H 5). They indicate the proximity of the dangerous Goodwin Sands (q.v.), and the anchorage of the Downs (q.v.).

FORENSIC MEDICINE. See MEDICAL JURISPRUDENCE.

FORESHORTENING. That view of a figure or portion of a figure which, obeying the laws of perspective, diminishes in actual extent according to the angle at which it is seen. For example, a figure looked at from below becomes condensed, as it were, in length, and in portraying such an abrupt view there would be less space demanded than if the figure stood upright on the same level as the observer. In the same sense an arm extended and pointing directly out of the picture would require less actual space on the canvas than an arm laterally extended. The representation, then, of this effect of reduced space suggesting at the same time the actual length of the object, is termed foreshortening. It is practiced more or less by all painters as occasion demands, and it is always called for in the painted ceiling where figures are represented as above one's head. Some of the chief masters of foreshortening among the Italians were Melozzo da Forli, Luca Signevelli, Michelangelo, Tintoretto, and, especially, Correggio, who, in his frescoes of the cupola of Parma went further than had any before him. His example was followed by painters of the Baroque and Rococo period, who introduced foreshortening into their works merely for the purpose of parading their technical skill. In modern times greater care prevails, and foreshortening is practiced only with reference to the laws of perspective.

FOREST (OF. *forest*, Fr. *forêt*, It., ML. *foresta*, forest, from Lat. *foras, foris*, out of doors, *fores*, door, Gk. *θύρα*, *thyra*, OChurch Slav. *dvĭrĭ*, Lith. *dùrys*, Goth. *daúrōns*, OHG. *turi*, Ger. *Thür*, AS. *duru*, Eng. *door*). A tract of land covered with a natural growth of trees. From the standpoint of vegetation the world may be roughly divided into forest, grassland, and desert, the area of each being determined by various climatic factors. Among these climatic factors atmospheric moisture takes a prominent place, as can readily be seen in comparing a vegetation chart of the world with a rainfall chart. Other things being equal, the greater the rainfall, the richer the forest. Forests seem to be in a measure independent of the seasonal distribution of rain, since they occur in regions of daily rain, of summer rain, or winter rain. Endurance through dry seasons is made possible by the great depth of tree-roots, and also by the thick and leathery leaf-texture in the case of evergreens, or by the shedding of leaves in deciduous trees. Because of the heat, more water is required by a tropical forest to meet the demands of transpiration than by a forest in the temperate zone. Another factor, perhaps of equal importance with moisture, is wind. Kihlman has shown that the presence or absence of trees in arctic regions is not a question of cold, nor even of a season's length, but of winter winds; trees grow only where they are protected from the great loss of water by transpiration induced by dry winter winds by being buried under the snow; the height of the trees thus marks the winter level of the snow. Since the winds of eastern Argentina are strong during the resting period, grassland is present, though the moisture is sufficient for a forest.

The forest formations of the world may be divided into eight types, based chiefly on the ecological characters of the leaves. (See LEAVES.) (1) The evergreen forest of the tropical regions of diurnal rainfall. This forest is especially well developed in the regions of the trade winds in oceanic climates, as of Brazil and Malaysia. This type is often called the rainy forest, and may be taken as representing the climax of the world's vegetation. Here plants grow in vast profusion and great diversity of form, and lianas, or climbing plants, and epiphytes reach their greatest development. Simultaneous periodicity is largely wanting, so that the forest is always in active life. (2) The deciduous monsoon forest, especially characteristic of the monsoon district of India, differs from the forest first named chiefly in having simultaneous periodicity. The other characters of the rainy season are present, but in a less complete degree. (3) The evergreen forest of the temperate zone is essentially an extension of the tropical evergreen forest into the cooler regions, especially of the Southern Hemisphere. It is peculiar to pronounced oceanic climates with markedly uniform temperature and moisture. (4) The deciduous forest of the north temperate zone is the typical forest formation of the eastern United States. The forests of beech, maple, chestnut, oak, etc., are too familiar to need description. The radical difference between the forests of the same latitudes in the Northern and Southern hemispheres is doubtless associated with the continental climates of the one and the oceanic climates of the other. (5) The deciduous savanna forest of the tropical and warm temperate regions is transitional between forest and grassland (q.v.), having a park-like aspect, which is due to scattered trees in a district where grasses form the chief undergrowth. Such a forest commonly has a moderate rainfall. (6) The thorny or scrubby forest of tropical and warm temperate regions where the rainfall is slight is transitional between forest and thicket (q.v.). (7) The forest of temperate regions where the rainfall occurs in winter, is finely shown in the Mediterranean region; coarse and leathery but large evergreen leaves, like those of the holly, laurel, oleander, and the evergreen oaks, may be taken as typical of such regions. (8) The conifer forests, the pines and firs with their leathery, needle-shaped evergreen leaves, form great forests in the colder regions of the temperate zones, especially of the Northern Hemisphere.

The forests heretofore discussed are all climatic and widespread. Edaphic (q.v.) or local forests also occur. Indeed, in most of the regions where the above climatic types are found, there are localities in which other forest combinations are present. For example, in a swamp in the deciduous zone of the northern United States there may be found tamarack, spruce, and white cedar. Close observation in such a place for many years would doubtless show the gradual dying out of these trees and their replacement by the ordinary members of the deciduous forest. On a hill there may often be found a pine-plant society, but this is not a permanent condition. Pines are often likely to be followed in a natural sequence by oaks, and they in turn by maples and beeches. These changeable plant societies may be called edaphic, while the ultimate forest toward which all are tending may be called the climatic formation. Viewed in this light the eight great forest types outlined above are forest formations.

FORESTALLING. The buying of provisions with a view to enhancing the price thereof in open market. This was a common-law offense, and was the subject of early and repeated legislation. It was described by statute of 5 and 6 Edw. VI., ch. 14, as the buying or contracting for any merchandise or victual coming in the way to market; or dissuading persons from bringing their goods or provisions there; or persuading them to enhance the price when there. It was analogous to engrossing (q.v.) and regrating (q.v.). Modern conditions of trade have rendered these practices legitimate and the laws intended to regulate them obsolete; while at the same time the abuses referred to have, under the name of 'corners' and monopolies, become more flagrant and oppressive. The laws against forestalling, etc., were formally repealed in England by statute 7 and 8 Vict., ch. 24. In the United States they have remained unenforced. Consult the authorities referred to under CRIMINAL LAW.

FOREST CANTONS, THE FOUR. The four cantons of Schwyz, Uri, Unterwalden, and Lucerne, in Switzerland.

FOREST CITY, The. A name given to Cleveland, Ohio, famous for its shade-trees.

FOR'ESTER, Frank. A nom-de-plume of Henry William Herbert (q.v.).

FORESTERS, Ancient Order of. A fraternal organization founded in 1745 when a Court of Foresters was established at Knaresborough Castle, in Yorkshire, England. The Order has existed continuously since then, and was introduced into the United States in 1832, by the establishment of Court Good Speed, 201, in Philadelphia. The growth of the Order was slow until 1864, when Court Brooklyn, 4421, was organized. In 1902 the courts numbered approximately 9000, with a total membership of nearly 1,000,000. The Order is one of the largest beneficiary societies in existence, with courts in 36 countries, a reserve fund of $36,000,000, and an income of $6,000,000. Funds are raised by fixed dues, and more than $5,000,000 annually are distributed in benefits.

FORESTERS, Independent Order of. A fraternal and benevolent society founded at Newark, N. J., in 1874, and reorganized in 1881. The Order is general throughout the United States and Canada, and has branches in Great Britain, Norway, France, India, and Australia. Its government is vested in a Supreme Court, with delegates from all the countries represented. High Courts, corresponding to the Grand Lodges of other societies, have supervision of the Order in various States and countries. Of these High Courts there were, in 1902, 20 in the United States, 8 in the British Isles, and one in Norway. The local bodies are called courts. The Order has a membership of some 200,000, has paid more than $11,000,000 in benefits since its organization, and has a surplus fund of over $5,600,000.

FORESTERS OF AMERICA. A benevolent and fraternal organization known under its present title since September, 1895. Originally the Order was part of the Ancient Order of Foresters, founded in England in 1745, and introduced in the United States in 1832. In 1889, however, the American Order freed itself from the jurisdiction of the High Court in England, and became a separate organization. It had, in 1902, some 1600 courts, or local branches, and a total membership of over 200,000. Its annual payments for benefits amount to $1,000,000.

FOREST FLY. The British name of a small, widely distributed fly (*Hippobosca equina*), representing that aberrant division of Diptera styled Eproboscidea (see Fly) and the family Hippoboscidæ. These minute insects are flea-like in appearance and habits, dwelling altogether as parasites among the hairs of animals and feathers of birds, and are sometimes called 'bird-ticks.' A common species on large birds in America is *Olfersia Americana.* Species of another genus, Lipoptera, have wings when young and live upon birds, but after a time they migrate to some mammal, and there, having no further use for their wings, wrench or bite them off. Another genus, Melophagus, includes the wingless sheep-ticks; a whole family, the spider-like bat-ticks (Nycteribiidæ), inhabit the fur of bats alone; and another includes the bee-louse (Braulidæ). All obtain their living by piercing the skin and sucking the blood with an extensile tube thrust out from the mouth. It is in this manner that the forest fly torments horses, especially the short-haired, thin-skinned animals of high breeding. An extraordinary feature in the economy of all these flies is that they do not lay their eggs, but retain them until they hatch into larvæ, and the larvæ are almost ready to pupate; not until then are they extruded by the parent, and only one is produced at a time. Hence the group has been named Pupipara by some systemists.

FORESTI, fō-rĕs'tē, Eleutario Felice (1793-1858). An Italian patriot and scholar. He was born at Conselice; graduated at the University of Bologna, practiced law at Ferrara, and in 1816 was made prætor at Crespino. In 1819 he was arrested as one of the Carbonari, and was kept in prison until 1836, when he came to the United States. He was for many years professor of Italian in Columbia College, and in 1858 he was appointed United States consul at Genoa. He published an edition of Ollendorff's Italian grammar (1846), and *Chrestomazia italiana* (1846).

FOREST LAWS (in England). Laws for the government of the forests in the King's possession. Such forests were vast tracts of country, containing not only woodland, but pastures and even villages, which might belong to other individuals than the King. Smaller tracts of woodland were called chases, or, if inclosed, parks, and might be included in a royal forest. The forests varied in number and extent at different times and were situated in different parts of the kingdom. Among the best known were New Forest, in Hampshire, Windsor Forest, and Epping Forest.

Most of them, indeed, dated from the Anglo-Saxon period, and having their origin in the uninclosed woodlands which had been national property, became royal demesne in the eleventh century. But all the Norman and early Plantagenet kings attempted, with varying success, to increase the forest area by afforestment, a summary proceeding, which consisted in simply proclaiming the desired tract a forest, after it had been inclosed with metes and bounds by royal commission. Sometimes the people were allowed to remain, but subject to the strict forest law; often they were ruthlessly driven away. The increase of the forest area was not only attempted by such high-handed monarchs as William I. and his sons. Until the fourteenth century it was a recurring source of complaint against the kings. Such wise kings as Henry II. and Edward I. were guilty of the same practice, and it was not until 1301 that the latter finally yielded to the wishes of his people, and permanently put an end to afforestment by force. When Henry VIII. created Hampton Court Forest, he was obliged to pay the freeholders for the lands of which he deprived them, and even Charles I. is said to have followed a like course when he created Richmond Park.

We have no means of determining the state of the law at the time of the Conquest. A series of enactments attributed to Canute is of such uncertain authority as to have been rejected by Coke in 1548, and Dr. Liebermann has recently shown that it is a forgery of about 1184. All that we know of his legislation on this subject is that he permitted every man to hunt in his own wood, but forbade trespassing in the King's forest.

The terrible severities of the Norman period are usually said to have been introduced under Henry I., but in his charter of liberties Henry professes merely to retain the forests as his father had held them. His law claimed supreme jurisdiction over private forests as well as over his own, and prescribed terrible penalties for the killing of game, among which were death, blinding, and emasculation. The Assize of the Forest, issued by Henry II. in 1184, retains these punishments, but mitigates others and prescribes the limits of the jurisdiction of forest courts. The extreme rigor with which this otherwise just King enforced the forest law gave cause for great complaint. In the Great Charter John renounced his afforestments, promised reform of all bad customs, and excused from attendance on the forest courts those not living in the forest. The Charter of the Forests, issued by the Earl Marshal for Henry III. in 1217, was a still more liberal document, greatly diminishing the punishments, the severest of which is now imprisonment for a year and a day. Besides confirming the provisions of Magna Charta, it permits freemen to exercise many other rights, such as those to mills, fish-ponds, marl-pits, arable land, falcons, etc., on their own land, within the forest. Renewed by Edward I., and supplemented by another ordinance in 1306, it remained the basis of the forest laws of the kingdom.

In general, the inhabitants of the forest folds were subject to the royal rights of forestry. These were both of *vert*, that is, to every kind of tree and brush in the forest, and *venison*, that is to say, to every wild beast of the forest. They were not allowed to hunt or cut wood or brush on their own land without license of the royal official. They, indeed, retained some rights of pasture for *commonable* beasts (excluding sheep, goats, geese, and swine), but they might not use as much as would deprive the King's beasts of food.

The officers of the forest were numerous and important. The master forester seems to have been independent even of the justiciar. There were two justices in eyre, one for this side of Trent and the other for beyond. The verderers were chosen in pursuance of royal writ by the freeholders of the forest from their own number to maintain the law. Besides the foresters, who were freemen sworn to preserve vert and venison in their respective bailiwicks, there were other minor officials.

The forest courts were three in number, running parallel with the ordinary courts of justice. There was the *woodmote*, or court of attachments, held before the verderers every forty days. It tried minor trespasses only, and could not convict. The *swanmote* was held three times a year by the same officials, all freeholders of the forest being bound to attend. Presentments were made by a jury which tried and convicted, but did not pass judgment. This was reserved for the justices in eyre, who every third year held the *court of justice seat*, a supreme court of civil and criminal jurisdiction over all offenses committed in a forest, whether against the forest law or not.

The last important general forest legislation was passed by the Long Parliament in 1640. Charles I. had been exacting fines for alleged encroachments on his forests, and Parliament replied with an act for the 'certainty of forests,' exempting from prosecution any alleged encroachments which were considered valid in the second year of James I. Since that act the laws of the forest have practically ceased. The Crown still retains ancient forestal rights over private lands in Dean Forest and in New Forest, but such rights survive as curious legal anomalies. During Queen Victoria's reign three of the royal forests, viz. Hainault, Whittlewood, and Wichwood, were disafforested by act of Parliament. It would be better, however, if the remainder, and particularly such as are near large cities, could be held as national parks and recreation grounds. This has recently been done in the case of Epping Forest near London, and seems to be the probable destiny of others as well.

The royal forests of Scotland were nearly as numerous as those of England, and their area was larger in proportion to that of the country. As in England, there was a special code for them. Indeed, this code is so much like the English that it seems to have been derived from it. The penalties, however, are not so severe, nor did afforestation play such a prominent part in the Scotch constitutional struggle as in the English. The best edition of the Scotch forest code is in the *Acts of the Parliaments of Scotland* (Edinburgh, 1844).

Bibliography. Most of the laws of the forest are given in convenient form by Stubbs, *Select Charters* (Oxford, 1895), as cited above; they are published in full in the *Statutes of the Realm*, Record Commission, vol. i. (1810); Coke's *Fourth Institute of the Laws of England* (London, 1548) is the earliest legal authority, and the most complete is Manwood's *Treatise of the Laws of the Forests* (London, 1598). For good brief modern descriptions, consult: Stubbs, *Constitutional History*, i. (Oxford, 1891); and "Forest Laws," in the *Encyclopædia of the Laws of England*, ed. by Ranton (London, 1895-98).

FOREST OAK. A name sometimes given in commerce to the timber of Casuarina torulosa, and other species of the same genus, all Australian trees. In Queensland the wood is considered as one of the most valuable for fuel, and is also split into shingles. It is light yellowish-brown and prettily marked with short red veins. It is exported for use in cabinet-work, for which purpose it is employed as veneer.

FOREST PRESERVATION. See Forestry; Lumber Industry.

FORESTRY (from ML. *foresteria*, *forestaria*, forestage, from *foresta*, forest). The economic management of trees as communities. It is distinct from arboriculture, which is more strictly concerned with the individual tree. Forestry looks to the conservation and utilization of the various forest products in order that the greatest returns may be obtained. It may apply to the planting of a new forest or the preservation of an old one, the reforestation of a mountain-side, the prevention of ruthless forest destruction, or the utilization of the forest products as a crop. The uses of a forest are to supply timber, fuel, etc.; to offer protection against winds; to conserve moisture, by storing up water or at least by checking its loss by seepage and evaporation;

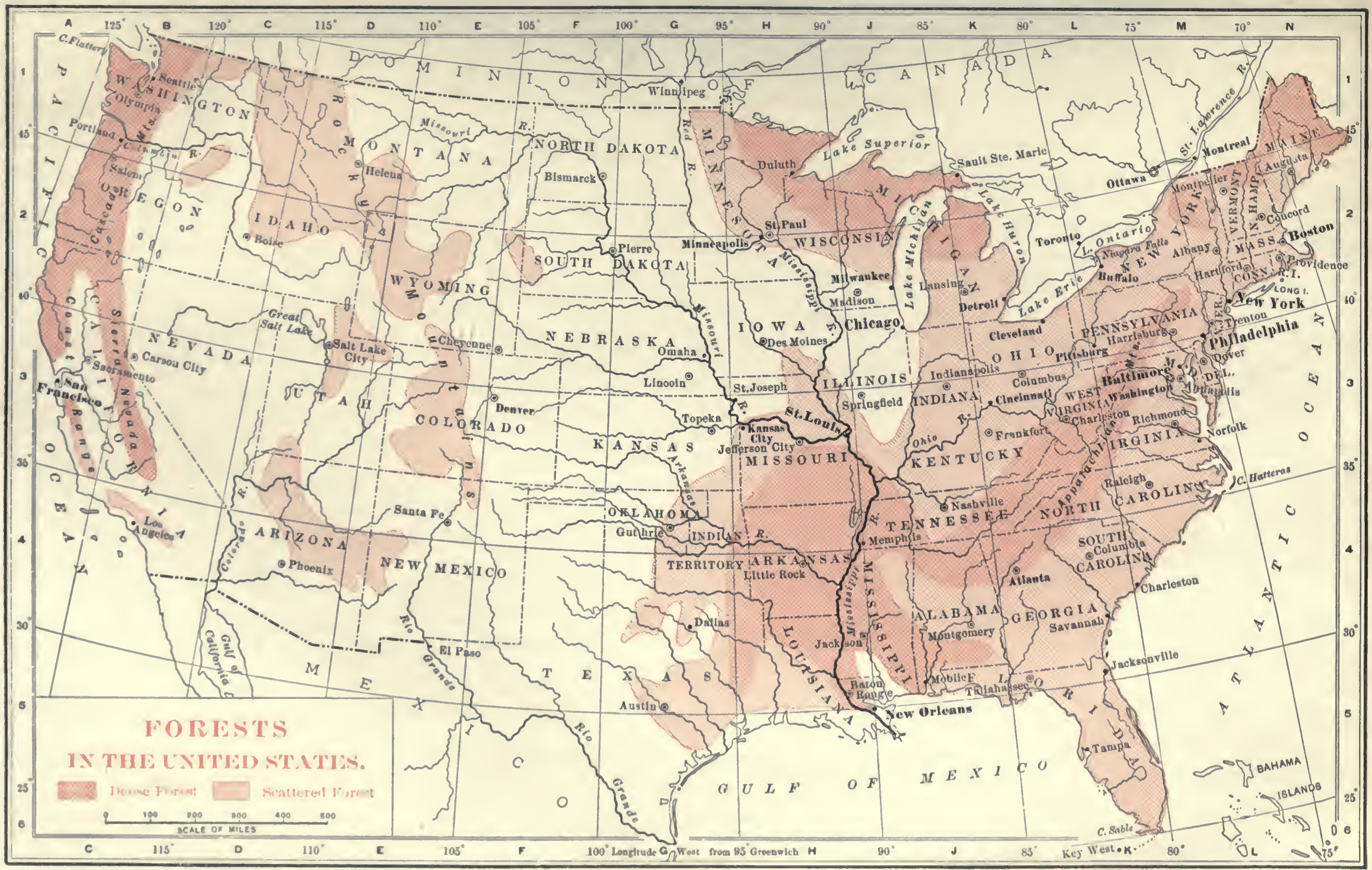
and to minister to the enjoyment of man in providing parks, game-covers, etc. In many new countries forests are considered detrimental to the growth of the varied interests upon which the new community is dependent, and they are removed as rapidly as possible. In old ones the lack of forests is keenly felt in various ways, and attempts have been made to restore, in part, the former wooded areas.

History. In some form, forestry has been practiced in Europe for several centuries. The growing scarcity of timber and fuel began to be felt in England early in the sixteenth century, and attempts were made to supply the failing resources by making new plantations and by more scientific cutting of the native growth. About the beginning of the eighteenth century plantings were begun in Scotland and later in Ireland; now the artificially planted areas exceed the natural ones. About this time there was great activity in the introduction of foreign species of forest trees, many of which were so well adapted to their new conditions that in places there are today more exotic than native trees. In France, Belgium, Germany, and other parts of Europe extensive areas of forests are now under systems of management that result in increasing rather than in decreasing production. Old native forests have been cared for, and denuded areas reforested. Governmental, communal, and private forests alike are so managed as to provide the various objects for which they were designed. In Germany and France the management of forests has received the greatest attention, and has been most systematically and scientifically conducted. Government schools are maintained for the education of skilled foresters, and special attention is paid this important subject.

Forestry in the United States. Forest regulation did not for a time seem as necessary in the United States, with its great forest wealth, as in Europe. However, with the destructive methods of lumbering and the enormous waste by forest fires, the supply has been so encroached upon that means have been taken to repair the damage and to provide against its continuance. Various States have enacted laws designed to correct the former abuses by granting bounties for tree-planting and remission of taxes upon purely forest areas. The general Government has also attempted to aid by laws providing for the acquirement of land upon the condition of planting a portion to trees. Since the laws enacted by the general Government were improperly prepared, interpreted, and enforced, and have resulted in little good, they have been repealed. The greatest good has probably come from the reservation of extensive areas about the watersheds and sources of some great rivers. There were in 1899 36 forest reserves in the United States, embracing more than 46,000,000 acres. They are as follows: Grand Cañon, San Francisco, Black Mesa, and Prescott in Arizona; Pecos and Gila River in New Mexico; Stanislaus, Sierra Forest, Lake Tahoe, Pine Mountain, Zaca Lake, San Bernardino, San Gabriel, San Jacinto, and Trabuco Cañon in California; Battlement Mesa, Pike's Peak, Plum Creek, South Platte, and White River in Colorado; Fish Lake and Uintah in Utah; Bitter Root and Priest River, in Idaho; Bitter Root, Flathead, Lewis and Clark, and Gallatin, in Montana; Cascade, Bull Run, and Ashland, in Oregon; Black Hills, Teton, Yellowstone, and Big Horn, in South Dakota and Wyoming; and Priest River, Olympic, and Mount Rainier, in Washington. In addition there are a number of State reserves, the object of which is mainly to prevent the too rapid escape of water in floods, and the succeeding periods of scanty water-supply for irrigation and other uses. They are situated at the sources of water-supplies, and are patroled to insure their safety against marauders and fires.

Forest Trees. Forests are of two kinds, pure and mixed. The former are less common than the latter, and are usually, though not always, composed of coniferous trees. One advantage of a pure forest is the greater ease in lumbering; one disadvantage is its liability to destruction by drought, insects, diseases, etc. Among species adapted to pure forests are pines, spruce, silver fir, Douglas fir, beech and maple. Those doing best in mixed woods are larch, birch, poplar, ash, oak, chestnut, and walnut. Mixed forests can be grown, and often are grown as a series of small colonies devoted to single species, but for general purposes mixed woods are most satisfactory. Since the requirements of different species differ as to light, moisture, and soil, the trees of mixed forests protect each other, and the forest floor, as the ground is called, better than those of pure forests.

Reforestation. Forests when once depleted are restocked in several ways. Although the setting out of young trees is one of the most expensive methods of restocking, it has been practiced to some extent in the plains region of the United States, and extensively in England. The seeds are sown and the young trees reared in nurseries where the peculiar requirements of the seedlings can be carefully met. After a growth of several seasons the trees are set in the places where they are to grow. Where the surface of the land will permit, they are often cultivated like any other crop until they attain a size sufficient to care for themselves. Frequently, too, crops of corn are grown in the spaces between the rows. While expensive, this method is best adapted to the conditions in the prairie region of the western United States. A second method is that of hand-seeding the region designed for the future forest. This method is followed in many places, but the difficulties of collecting and caring for the seed prior to seeding are so great as to make this method unsatisfactory. Natural seeding is largely depended upon to restock scientifically managed forests, occasional seed-bearing trees being left for the purpose. In some places the practice of thinning out the growth is followed to give the new stock of seedlings the air and light they require. Lastly, sprouts or suckers from the stumps and roots of trees that have been cut are often used for restocking. This method will apply only to such broad-leaved species as renew themselves in this way. They should be cut while dormant. This is about the only way employed in the reproduction of coppice woods. (See Copse.) As a rule the conifers do not sprout from their stumps. Pruning and thinning must be given some attention. Natural pruning is most satisfactory, and will be done by the trees themselves if they are planted close enough. In natural pruning the lower twigs and branches die because close planting prevents their obtaining sufficient light. In time these dead parts are broken off and their stubs



FORESTS IN THE UNITED STATES.

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are buried by the trunk as it increases in girth. Thinning, on the other hand, must be done from time to time so as to prevent overcrowding. When branches are cut off, the cut should be close to the main trunk, and where the wound is too large to heal over in a single year or possibly two, the cut surface should be protected against the entrance of fungi by painting it.

Economic Returns. The financial returns from forests depend upon a number of factors, but in any case they are tardy. In copses the whole area may be cut over every twenty or thirty years, while forests grown for timber must of necessity be of greater age. By conservative management, where the land is not too valuable at the beginning and markets are convenient, it is believed that four per cent. can be realized in European forests, and there are records of even greater returns in the United States. A ten-year-old plantation of hardy catalpa in Kansas is said to have yielded a net gain of $197.55 per acre, which sum could have been increased by continuing the marketing over a longer period.

Since it has been shown that private holdings of forest areas can be so managed as to be a source of continual revenue without imparing the original capital, many large owners are availing themselves of the opportunity offered by the Government to secure the aid of expert foresters in planning their management. To provide experts schools of forestry have been established at Cornell and Yale universities, and forestry instruction is given in the agricultural colleges of a number of States.

Climatic Influence. The climatic influences of forests are very great. Whether forests are actually instrumental in securing greater rainfall is somewhat problematical. Observations covering a long period of years and a large extent of forest are not sufficiently abundant to determine this point. That they do aid very materially in conserving moisture is not to be denied, and as a factor in the distribution of water they are equally important. In tempering hot and cold winds and as wind-breaks, they are of great importance. The temperature in a forest is lower in summer and warmer in winter than in an adjacent open tract, and this influence may be exerted to a considerable distance. The use of forests as a means for reclaiming tracts of almost barren sand and for protecting regions against wind-shifted sand are well shown by some of the forests of France.

Forest Enemies. The worst enemies of forests are man, through the agency of destructive lumbering, forest fires, grazing of animals, especially sheep; insect attacks, and fungous diseases. Mixed forests are not so subject to great loss from the last two causes as pure woods, since the same fungus or insect seldom attacks any great number of species of trees. Public sentiment, knowledge of how to prevent the other losses, and how to make forestry profitable, must protect against the other enemies. See Arboriculture; Forest.

FORESTRY ASSOCIATION, American. An association to further the conservation, correct management, and renewal of forests; to collect forest statistics, and to promote legislation for those ends. The excessive waste of forests in the United States, the destructive forest fires, and the no less destructive methods of cutting, led to the formation of the Forestry Association in 1875, in the hope of correcting these evils. The association merged in 1882 with the American Forestry Congress, organized that year in Cincinnati, Ohio, and it was incorporated in 1897. The society has had the support of the Department of Agriculture of the Federal Government, and has coöperated with various State and local forestry associations. Annual meetings are held, at which papers are read covering all aspects of the forestry question, and the *Proceedings of the American Forestry Association* are published annually at Washington, D. C. *Forestry and Irrigation*, a monthly journal, is also published.

FOREY, fô′rȧ′, Elie Frédéric (1804-72). A French soldier. He was born in Paris, was educated at Saint-Cyr, accompanied an expedition to Algeria in 1830, and in 1852 attained the rank of general of division. He was conspicuous in the Crimean War and in the Italian campaign of 1859, and in 1862 was sent to Mexico as military and civil administrator and Minister Plenipotentiary. He promised the Mexicans that their liberties should be preserved and their rights respected, but he nevertheless sequestered the goods of many of those who were opposed to Maximilian. Puebla surrendered on May 17, 1863, after a long siege. The City of Mexico was soon occupied, and a provisional government was formed. Forey was, however, replaced by Bazine, became a marshal in the same year, and soon afterwards was given command of a corps d'armée.

FORFAIT, fôr′fȧ′, Pierre Alexandre Laurent (1752-1807). A French engineer, born at Rouen. In 1773 he was elected a member of the Academy of Rouen, in 1781 became an engineer in the French navy, and in 1787 was intrusted with the construction of packet-boats running between France and the French colonies, and to the United States. In 1791 he was elected from Seine-Inférieure to the Constituent Assembly. He was charged by Napoleon with the naval preparations for the invasion of Egypt, and from 1799 to 1801 was Minister of Marine and the Colonies. Subsequently he was appointed a councilor of State, and inspector-general of the fleet designed to be employed in the invasion of England. He was the inventor of the Seine boat, wrote many scientific papers, and published a *Traité élémentaire de la nature des vaisseaux* (1788).

FORFANG, or **FOREFANG** (Sax. *fore*, before, and *fangen*, to take). In old English law, the offense of buying up provisions, grain, etc., at a fair or market, before the King's purveyors were served with necessaries for his Majesty. It is denounced in a charter of Henry I. in 1133, but has long been obsolete. The term *forfang* was also used in Anglo-Saxon law to describe the lawful recovery, by force and arms, of stolen or strayed cattle from a thief, or from those having illegal possession of them, as well as the reward fixed for such rescue.

FORFAR, fôr′fẽr. The county-town of Forfarshire, Scotland, a Parliamentary and royal burgh situated in the Vale of Strathmore, 14 miles north-northeast of Dundee (Map: Scotland, F 3). The Scottish Midland Junction Railway connects it with Aberdeen. Linen is its staple manufacture. Supposed to be the ancient *Orrea*, it was once the seat of the Scottish kings. David I. (1124-53) made it a royal burgh. In 1308 Bruce destroyed the castle, and according to

Boece, Forfar by 1526 had dwindled to 'a country village.' Since the middle of the eighteenth century it has grown into a prosperous town. Population, in 1891, 12,844; in 1901, 12,061. In the neighborhood is Glamis Castle, the seat of the Earl of Strathmore.

FOR'FARSHIRE, or **ANGUS.** A maritime county in the East-Midland Division of Scotland, bounded east by the North Sea, north by Kincardineshire and Aberdeenshire, west by Perthshire, and south by the Firth of Tay (Map: Scotland, F 3). Area, 875 square miles. The surface of the county is irregular, and intersected with hills, the Sidlaw being 1400 feet high, and Catlaw, the highest, 2264 feet. The chief rivers are the Tay, North Esk, South Esk, and Isla. Forfarshire is an agricultural county, and also the chief seat of Scotch linen manufactures. Capital, Forfar; other important towns are Dundee, Montrose, and Brechin. Population, in 1801, 99,000; in 1851, 191,260; in 1901, 284,000. Consult Warden, *Angus or Forfarshire* (4 vols., Edinburgh, 1880-83).

FORFEITURE. The loss of title to property, as a punishment for crime or other unlawful act. Personal as well as real property is subject to forfeiture, and the penalty may be incurred for civil as well as for criminal offenses. The forfeiture of lands was a penalty of the feudal law, and was a direct consequence of the feudal relation of landlord and tenant. This relation was primarily personal and confidential, the lord owing protection to his vassal, and the vassal being bound to the highest degree of loyalty and devotion to his lord. As it was this feudal relation of interdependence which made the vassal a legal person (*homo legalis*)—i.e. a member of society protected by the political organization of the State and its machinery of justice—so the rupture of this feudal relation by any disloyalty operated at once to render the tenant a man without law, a lawless man, or outlaw. As he held his lands, his goods, and even his life on the condition of loyalty to this feudal bond, its breach naturally involved the forfeiture of these.

Forfeiture for Crime. The penalty of forfeiture for treason prevailed in England before the Conquest, as is clear from the fact that lands held in gavelkind, which is a Saxon tenure, may be forfeited for treason. But after the Conquest forfeiture of lands and goods came to be regarded as the peculiar punishment of felony, of which treason against the sovereign was the highest kind, and was denominated high treason, to distinguish it from all other felonies, which were called petty treason. In cases of treason the offender forfeits all his lands absolutely to the Crown. Upon conviction of felony, according to the old law, the offender forfeited to the Crown the profits of all estates of freehold during his life, and all his estates in fee simple for a year and a day, after which they became escheat to the lord. The Crown, during the year of occupancy, was entitled to commit upon the lands what waste (q.v.) it pleased. By Magna Charta this power of committing waste was restrained. But by 17 Edw. II., c. 16, the King's right to waste was again recognized. In all felonies the goods and chattels of the offender are, on conviction, forfeited to the Crown; but until conviction forfeiture of the goods does not operate. Where, therefore, a person has disposed of his goods before conviction, the Crown cannot reach them. Forfeiture of lands does not take effect until sentence of attainder (q.v.) has been pronounced. So that a person committing *felo de se* (q.v.), or a rebel dying before sentence, or killed in open rebellion, does not forfeit his lands. But sentence of attainder, as soon as pronounced, has a retroactive effect, and annuls all conveyances made between the act of treason or felony and the pronouncing of sentence. Conveyances made before the act of treason are not affected. Hence, a wife's jointure is not forfeited, because settled on her before the commission of the act. The same thing is true of the wife's dower in all lands of which her husband was seized prior to the commission of the treasonable acts charged.

Forfeiture for treason and felony is accompanied by *corruption of blood,* whereby the offender is incapable of inheriting any lands or of transmitting any title to an heir. It was this doctrine which produced the escheat of forfeited lands, to which reference has been made above. The tenant, having been cut off by his crime from all human relationships, his blood being corrupted—i.e. bastardized and rendered illegal—by the attainder, has no lawful heirs to whom the lands can descend, and there being thus a failure of heirs, the land escheats to the lord of whom it is held. (See Escheat.) By 7 Anne, c. 21, it was enacted that after the death of the Pretender and his sons no attainder for treason should operate to the prejudice of other than the offender himself; but this provision was repealed (39 Geo. III., c. 93). In 1870, however, the Crown's claim of forfeiture was abolished in all cases but outlawry (Forfeiture Act, 33 and 34 Vict., c 23, § 1), and in 1879 (42 and 43 Vict., c. 59, § 3) outlawry in civil cases was also abolished.

In the United States conviction of felony has never been attended with forfeiture, and the penalty of forfeiture for treason is confined within narrow limits by the Federal and State constitutions. See Attainder.

Civil Forfeiture. Civil forfeiture may be incurred in England in five ways—viz. by tortious alienation, by wrongful disclaimer, by alienation in mortmain, by breach of condition, and by the commission of waste. The first three of these modes were incidents of the feudal tenure of lands; the last two were introduced by statute. It must be observed that, according to the earliest feudal customs, a gift of lands was always made in favor of a particular person, and that alienation, without consent of the overlord, involved a forfeiture of the fee. But this strictness having by degrees ceased to be observed, forfeiture was only incurred in case of a tortious alienation. Tortious alienation was where the owner of a particular estate conveyed by common-law conveyance, as feoffment, fine, or recovery, a greater estate than that to which he was himself entitled, as where a tenant for life made a feoffment in fee. The immediate effect of this act was the forfeiture of the land to the remainderman or reversioner. By 3 and 4 Will. IV., c. 74, abolishing fines and recoveries, and 8 and 9 Vict., c. 106, § 4, declaring that feoffment should not have a tortious operation, forfeiture by tortious alienation has ceased to have practical importance. (See Feoffment.) Forfeiture by wrongful disclaimer was where a tenant holding of a superior lord, on being summoned in any court of record, either disclaimed his allegiance or did any act which amounted to a disclaimer. Since the abolition by the statute *quia emptores*, or subinfeudation, this species of forfeiture can only arise in lands held of the Crown. Forfeiture by alienation in mortmain is incurred by the conveyance of lands or tenements in favor of any corporation (q.v.), sole or aggregate, ecclesiastical or temporal. As by vesting the land in a tenant of this description the overlord was deprived of all the duties and services due by his vassal, this act was declared by various acts of Parliament to involve the forfeiture of the lands. (See Mortmain.) Forfeiture of copyholds was incurred by committing waste, and by other acts of a wrongful kind inconsistent with the fealty due to the lord. By the statutes of Marlborough (52 Hen. III., 1267) and Gloucester (6 Edw. I., 1278), the penalty of forfeiture was affixed to the commission of waste by any tenants for life or for years, as well as by guardians in chivalry. (See Waste.) Forfeiture on breach of condition subsequent is where an estate is held upon a condition contained in the grant itself. On failure of the condition the grantor or his heirs may enter upon the lands. See Condition; Entry, Right of.

In Scotland civil forfeiture may arise either from statutory enactment, at common law, or by agreement. By a statute of 1597 it was enacted that vassals failing to pay their feu duties for two years should forfeit their right. This forfeiture must be established by an action to recover the feu duties in arrear, and might be avoided by payment at the bar. At common law, a vassal forfeited his land by disclamation or purpresture. The former is analogous to the English disclaimer, and consists in the denial by a vassal of his lawful superior. Purpresture was incurred by the vassal's encroachment on the streets, highways, or commonalties belonging to the Crown or other superior. These forms of forfeiture are fallen into disuse. Forfeiture on special agreement depends wholly upon the terms of the condition inserted in the titles to the land. See Fee; Feudal System; Irritancy; Tenure.

In the United States civil forfeiture is generally limited to acts of waste committed by tenants for life or years, and to the breach of conditions upon which lands are granted, and in a few States even these have been abolished. But there are certain offenses in regard to which particular statutes have been enacted by Congress exacting the forfeiture of property employed as a means of committing the wrongful act or used in an unlawful transaction; but forfeiture in such cases applies only to the particular property designated, and not generally to chattels or lands, as in the other instances which have been maintained. Thus, laws have been passed from time to time providing that smuggling or importation of goods under fraudulent invoices shall cause a forfeiture either of the entire invoice or of the property wrongfully imported. Acts of piracy entail a forfeiture of the piratical craft and its appurtenances. The same was true of vessels engaged in the slave trade.

FORGÁCH, or **FORGÁCS**, fŏr′gäch. A noble family of Hungary, which traces its origin to the time of King Stephen. Francis Forgách (1510-75) was Bishop of Grosswardein (1556-67). He took part in the Council of Trent. He afterwards traveled to Italy and produced a work on contemporary Hungarian history, *Rerum Hungaricum Sui Temporis Commentarii Libri XXII., 1540-1572*, republished in 1866 by Major in the *Monumenta Hungariæ Historica*. Among the more recent members of the family may be mentioned Count Ignatius Forgách (1702-72), a general under Maria Theresa, and Count Anton Forgách (1819-85), who held several offices under Ferdinand and Francis Joseph. From 1861 to 1864 he was Hungarian High Chancellor, and showed himself a stanch supporter of the old Conservative Party. After 1869 he was Deputy in the Hungarian Diet.

FORGE, FORGING (from OF. *forge*, from Lat. *fabrica*, workshop, from *faber*, smith). A forge is a furnace or open fire, commonly fitted with a bellows or air-blast, for heating metal which is to be formed into special shapes by forging; forging is the process of hammering or pressing hot metal into special shapes for use in engineering and the arts. Forges are made in all sizes, from the miniature gas-heating device used by jewelers to the great furnaces for heating steel ingots, armor-plates, engine-shafts, etc., weighing many tons; and they may be either fixed or portable. Portable forges are usually constructed of metal, and are of small size; they comprise a shallow pan or hearth for the fire, a bellows or fan for blowing the fire, and the hand or power mechanism for operating the blast-producing device. Fixed forges are usually built of masonry with an interior lining of fire-brick or other refractory material, and the blast is produced by power blowers.

Originally forging was a hammering process solely, but recently forging by presses has come into use, especially for making heavy forgings of steel. Forging by hammering may be done either by hand or by power. Hand hammering or forging is usually confined to the production of small forgings or to finishing large forgings produced by power hammers. The process is a simple one, and is familiar to any one who has observed a blacksmith fashioning horse-shoes or similar small articles. Power forging by hammers is nothing more than the hand-hammering process accomplished by means of heavy hammers operated by steam or other power. (See Hammer.) It is employed in the production of large forgings for engines and machinery. Forging by presses consists in substituting for the power hammer, with its sudden heavy blow, a hydraulic press which squeezes the metal into shape by a comparatively slow, steady pressure. Steel forgings for engine-shafts, armor-plates, etc., are usually made by pressing. The process may be illustrated by tracing the operations conducted in forging a modern hollow steamship shaft. An ingot of open-hearth steel of proper chemical composition to give the necessary physical properties is cast approximately twice the size of the finished shaft. The metal is then submitted, while liquid, to hydraulic pressure of 7000 tons, or thereabouts, until cold, great care being taken to cool the ingot slowly and equally on all sides to prevent strains or cracks from forming on account of unequal contraction. When the ingot is cold, the sand from the mold which has adhered to it is cleaned off, and then, if intended for a small shaft, it is ready for the forging process proper. If the shaft is to be of more than 12 or 14 inches in diameter, a hole is bored through the axis of the ingot. The size of this hole varies according to the size of the shaft and the service to which it is to be eventually subjected. Generally speaking, however, it is made from one-third to two-fifths the diameter of the finished shaft. The first operation in the process of forging is the reheating of the ingot. This is a very delicate operation. Great care must be taken to insure a slow and uniform penetration of the metal by the heat, as there is, otherwise, danger of expanding the surface metal so rapidly that it will crack away from that underneath, which has not been heated to the same temperature. The hole in the centre of large ingots allows the interior and exterior to heat up and expand together, thus relieving this tendency to crack. When the ingot is heated, it is forged into shape under a slow-moving hydraulic press of from 2000 to 5000 tons capacity instead of the rapid steam hammer of from 5 to 25 tons falling weight. In the case of the hollow ingot, a steel mandrel is inserted, of a size to fit loosely into the hole, and the metal is forged down to shape in the same manner as is employed with a solid shaft. Generally the shaft, if very long, has to be reheated one or more times during the forging. The finishing process consists in annealing or tempering the shaft, when it is ready to be machined.

Many small articles of common use are forged by machinery. Balls, screw and rivet blanks, nuts, nails, etc., are among the more familiar machine-forged articles. In general the process consists in inserting steel bars, heated to the proper temperature and of suitable cross-section, into a machine automatically operating, which cuts off the proper lengths and stamps or presses it into shape between dies. The process is a continuous one, one heated rod being inserted after another as fast as the machine will handle them. Many articles of intricate pattern are drop-forged. In this process an upper and lower die are employed. The lower die is placed on the anvil of a drop-hammer, the heated piece of metal placed on it, and the upper die placed on top of the heated metal. A hammer falling from a height strikes the upper die, and thus stamps the plastic metal into shape between the dies. Drop-hammers are made of various sizes; the largest now in operation has a 3000-pound hammer.

FORGERY (Fr. *forger,* to form metal into shape, to fabricate). The *crimen falsi* of the Roman law is held in English common law to be the fraudulent making or altering of a writing or seal, to the prejudice of another man's right, or of a stamp to the prejudice of the revenue. As regards writings, the instrument forged must be executed with such skill or in such circumstances as to be capable of being mistaken for a genuine document by a person of ordinary intelligence and observation. It is not necessary that there should be even an attempt at imitation. If there was intention to deceive, and the circumstances were such as to render deception possible, the crime has been committed, and consequently it is possible to forge the name of a person who cannot write. Any material alteration, however slight, is a forgery just as much as the subscription of the name of the pretended maker, or the fabrication of the entire writing. It will not lessen the crime, though the whole writing should be genuine, the name only being forged, or the name being really the handwriting of the party to whom it belongs, but appended to a forged writing. Even if the name be a fictitious one, but appended for the purpose of deceiving, a forgery has been committed just as much as if it belonged to a real person. The offense is not limited to the fabrication of writings, using that term in its literal sense. It includes the fabrication of printed or engraved instruments, such as railroad tickets, corporation certificates, or bonds, and the like. Falsely painting an artist's name in the corner of a picture is not forgery, however, for the picture is not a document or writing. Moreover, the document which is fabricated must be such as to have an apparent legal efficacy. A letter of introduction, though requesting a personal favor for the bearer from the one to whom it is addressed, is not a subject of criminal forgery, as it does not purport to confer any legal right or to impose any legal duty. At common law forgery is a misdemeanor, punishable by fine and imprisonment, or both.

To secure a conviction for forgery it is necessary to prove an intent to defraud, but it is not necessary that the purpose should have been actually effected; it is sufficient to show that the forgery would have proved injurious to an other's interests. The different State laws in this country generally define specific offenses as constituting the crime of forgery, but these laws do not interfere with the character of the offense at common law, but simply provide a special and increased punishment in such cases as they particularly enumerate. Consult: Stephen, *History of the Criminal Law of England* (London, 1883); and the authorities referred to under CRIMINAL LAW.

FORGET-ME-NOT (Myosotis). A genus of annual or biennial herbs of the order Boragineæ with small, generally blue flowers. The genus is distributed over the temperate zones in all quarters of the world, and a number of species are common in America, growing chiefly in ditches and damp meadows. *Myosotis palustris* and the closely related *Myosotis laxa* have crooked, creeping perennial roots, an angular stem one to two feet in height, and calyx covered with appressed bristles. *Myosotis sylvatica,* with calyx covered with stiff spreading hairs, grows in bushy places and woods, and is often planted in flower-gardens. It is especially admired for the size and brilliancy of its flowers. The dark-blue forget-me-not of the Azores (*Myosotis Azorica*) is cultivated in Europe, but requires the greenhouse. The genus is a favorite with most persons, both because of the brilliancy of the flowers, and because it is generally regarded as the emblem of friendship. The English name, scorpion grass, is now seldom heard. The German name, *Vergissmeinnicht,* corresponds with the English forget-me-not. *Myosotis versicolor,* very common in Great Britain, often as a weed in gardens, is remarkable for the change of color in the very small flowers, which are first yellow, then blue. Some species occur in such great abundance in parts of Alaska as to color the hillsides. *Myosotis verna* is rather abundant in dry places of the eastern United States during May and June.

FORKBEARD (so called from the apparent bifurcation of the ventral fins). A British hake

(*Phycis blennoides*), also called hake's dame, the ventral fins of which are long and filamentous. See HAKE.

FOR′KEL, JOHANN NIKOLAUS (1749-1818). A German writer on music. He was born at Meeder, Saxe-Coburg, was organist to the University Church in Göttingen, and later director of music at the university. Though he acquired considerable reputation as organist and harpist, his chief interests were the theory and the history of music. He wrote a *Musikalisch-kritische Bibliothek.* Especially noteworthy is his *Allgemeine Geschichte der Musik* (2 vols., 1788-1801).

FORKS (AS. *forc*, Icel. *forkr*, OHG. *furka*, Ger. *Furke*, from Lat. *furca*, fork). Forks, as table instruments, are only about three centuries old. The Greeks, Romans, and other ancient nations knew nothing of them. They had large forks for hay, and also iron forks for taking meat out of pots, but no instruments of the nature of table-forks. In ancient times, as is the practice still in the East, meat was commonly prepared in stews; or if roasted, it was cut into small pieces by a carver so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. The use of any species of forks at table was quite unknown till the fifteenth century, and then only in Italy. None of the sovereigns of England had forks till after the reign of Henry VIII., all persons, high and low, using their fingers. The first royal personage in England who is known to have had a fork was Queen Elizabeth; but, although several were presented to her, it remains doubtful whether she used them on ordinary occasions. From the inventory of her Majesty's appointments it would appear that these forks were more for ornament than for use.

Forks came so slowly into use in England, that they were employed only by the highest classes at the middle of the seventeenth century. About the period of the Revolution of 1688, few noblemen had more than a dozen forks of silver, along with a few of iron or steel. At length, for general use, steel forks became an article of manufacture at Sheffield. They had at first but two prongs, and it was only in later times that the three-pronged kind were made. As late as the early part of the eighteenth century table-forks were kept on so meagre a scale by country inns in Scotland (and perhaps also in some parts of England) that it was customary for gentlemen in traveling to carry with them a portable knife and fork in a case. The general introduction of silver forks into Great Britain is comparatively recent; it can be dated no further back than the opening of the Continent to English tourists at the termination of the French war in 1814.

FORKTAIL. A name applied to various birds having noticeably forked tails, as the scissor-tailed fly-catcher (see Plate of FLY-CATCHERS) or a kite. Specifically, however, it has become the name of a group of small black-and-white insectivorous birds of mountainous regions from northern India to Borneo, which have long forked tails kept incessantly in motion. They constitute the genus Henicurus, and place their large nests beside a stone or log, close to the edge of small streams.

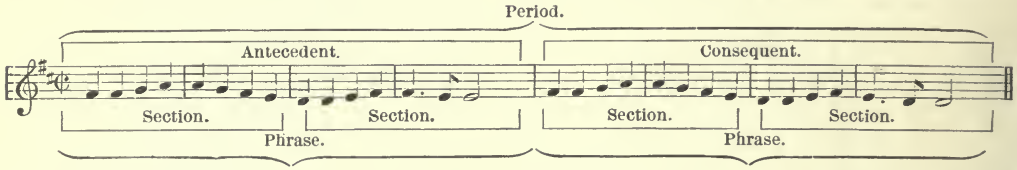
FORLÌ, fôr-lē′. The capital of the Province of Forlì, in central Italy, on the right bank of the Montone, 40 miles southeast of Bologna (Map: Italy, G 3). In the churches of Santi Biagio e Girolamo and of San Mercuriale, named after the first Bishop of Forlì, are paintings by Palmezzano and others. The imposing Cathedral of Santa Croce has been almost entirely rebuilt since 1844, and in the Church of San Pellegrino is a fine fifteenth-century tomb. The collection of paintings in the municipal Pinacoteca is important. The citadel, built in 1361 by Cardinal Albornoz, is now used as a prison. Forlì has a lyceum, a seminary, a technical institute, a library of over 5000 volumes, a hospital (founded in 1636), and a chamber of commerce. It markets grain, wine, cattle, silk, and hemp, and manufactures machinery, pottery, and furniture. The ancient Forum Livii is said to have been founded by and named after Livius Salinator, in B.C. 207, after his victory over Hasdrubal on the Metaurus. Early in the Middle Ages it was part of the Exarchate of Ravenna, changed masters during the struggles of Guelphs and Ghibellines, and was annexed to the States of the Church in 1512 by Julius II. Population, in 1881, 41,000; in 1901, 43,708.

FORLÌ, MELOZZO DA (c.1438-94). An Italian painter, born at Forlì. He was a pupil of Ansuino da Forlì, but was more influenced by Mantegna, and especially by Piero della Francesca, then at the height of his fame, and of whom he may at one time have been a pupil. Melozzo was introduced to the notice of Pope Sixtus IV., and became a favorite painter. For this Pope and his nephew, Cardinal Riario, he executed his two great frescoes, "An Audience of Sixtus IV.," for the Vatican Library, and an "Ascension," for the Church of the Santi Apostoli. The first of these has been transferred to canvas, and is in the Vatican Picture Gallery; the latter is in fragments, some of which are in the Quirinal. The angel musicians in the sacristy of Saint Peter's are among the most exquisite examples of early Italian art. The whole work shows that Melozzo understood foreshortening, a part of perspective then little studied. In 1480 he returned to Forlì, and not long afterwards entered the service of Federigo da Montefeltro at Urbino, and executed the "Personification of the Arts and the Sciences" for the ducal library. This fresco is also in fragments. Berlin and London each possess portions of it. His paintings are rare, and many attributed to him are of doubtful authenticity. Consult Schmarzow, *Melozzo da Forlì* (Stuttgart, 1886).

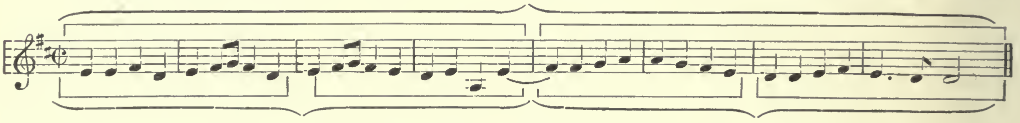
FORLORN HOPE. A detachment of troops assigned to a desperate undertaking. They are usually volunteers. In the German Army it is known as *Die verlornen Posten*.

FORM (Lat. *forma*, shape). In botany, the unit of ecology, as the species is the unit of classification or taxonomy. The term is often used in expressions such as 'life form,' 'plant form,' and 'form of vegetation.' See ECOLOGY; TAXONOMY.

FORM. In music, that element which unites all the various parts into an harmonious whole. It is essential that these various parts should have some intimate relation to one another, otherwise they could only be loosely strung together, and could never represent artistic unity. Musical unity is attained by various means, such as the repetition of musical motives or phrases, the maintaining of a certain rhythm or figuration, the choice of a fixed tonality. Dissonant or contrasting elements are not excluded, but they must be resolved into a higher unity. The germ of all musical form is the two-measure motive or *section.* A combination of two sections forms a *phrase,* of two phrases a *period.* The first two phrases constitute the *antecedent,* the last two the *consequent.* The following example from Beethoven shows this:



To this period Beethoven adds another one similarly constructed, and standing to the above in the relation of consequent to antecedent:



These two periods together constitute what is known as the simple *Liedform.* Symmetry is one of the most essential features of all musical works, and a composition is unintelligible unless its themes are so arranged that the architectonic structure of the whole, so to speak, presents perfect symmetry. The three fundamental forms are the liedform, sonata-form, and rondo-form. See LIED; SONATA; RONDO.

The grouping of the themes in these forms is as follows:

I. Liedform. A—B—A.

II. Sonata-form [: A (key of tonic) ; B (key of dominant) :]—$\frac{A}{B}$—A—B (in key of tonic).

III. Rondo-form (a) with two themes; A—B—A (in key of B) ; B (in key of A)—A; (b) with three themes A—B—A—C—A—B—A. The second and third time A appears in keys different from the original.

These forms admit of considerable variety, and the great masters, especially Beethoven, have been inexhaustible in ingenious combinations of themes. No definite rules can be laid down in this respect; anything is permissible that does not destry the symmetry of the whole. In cyclical compositions symmetry between the various movements is maintained by the proportion of the various movements to one another, the relation of their keys, the alternation of slow and fast tempo, and sometimes also the introduction of a theme from a previous movement (Beethoven, Symphony No. 9). See CYCLICAL FORMS.

Instrumental forms were originally developed from simple vocal forms. Their development has been the slow product of centuries. Simple dances were united in the suite (q.v.), which gradually developed and evolved the sonata. From the stringing together of madrigals arose the original *dramma per musica*, which became the *opera* (q.v.) and culminated in the *musical drama* (q.v.). For a careful study of musical forms consult Lavignac, *Music and Musicians*, translated from the French by Marchant, with additions by Krehbiel (New York, 1898).

FORM. In philosophy, a term used by Plato (Gk. *ἰδέα, εἶδος*) to express the reality of a thing; that which makes it what it is, and which is permanent; in contrast with appearances and objects of sensation that pass away and are altered as they pass. The metaphysical character of Plato's forms, or ideas, has been the subject of much dispute, the question being whether Plato conceived them as having an existence in independence of the world of sense, or whether they were not for Plato very much what laws of nature are for the modern scientist. Aristotle gave the authority of his great name to the former interpretation, which has thus become traditional. Aristotle himself used the word *form* as expressing the essence of a thing, and this meaning became current in scholasticism, especially in the expression 'essential form.' Bacon used the word *forms* in the sense of "the laws and modes of action which regulate and constitute any simple nature, such as heat, light, weight, in all kinds of matter susceptible of them; so that the form of heat and the law of heat, or the form of light and the law of light, are the same thing." But Bacon did not succeed in keeping it free from scholastic connotation, even in his own use of the word. Kant used the term in the sense of a framework, supplied by the nature of the mind in its percipient character; within this framework the materials of sense are organized by the action of thought. Kant recognized two such forms, *space* and *time.* In this sense, form is subjective, i.e. it is not a characteristic belonging to an object as it is in its own intimate nature, but only as it appears in experience. Hegel pointed out the impossibility of thus separating the objective and the subjective, and used form in the sense of the total effect of a unity of distinctions.

FOR'MAL, JAMES. A rich old merchant in Wycherley's *Dancing Master.* He is the jealous guardian of an amorous daughter, and vainly tries to keep her from sight of the male sex. He affects Spanish manners, and is familiarly known as Don Diego.

FOR'MAN, HARRY BUXTON (1842—). An English author, born in London. He entered the civil service in 1860, and is now assistant secretary in the general post-office and comptroller of packet services. Known for his essays and his editions of Shelley (1876-80) and Keats (1883), he has also published *The Letters of Keats to Fanny Brawne* (1878); *The Shelley Library* (1886); *E. B. Browning and Her Scarcer Books* (1896); and *The Books of William Morris* (1897).

FORMAN, Simon (1552-1611). A notorious English astrologer and quack doctor. He claimed to have discovered his marvelous powers in 1579, and thereafter practiced as a quack. Strangely enough, he received later (1603) the degree M.D. from Jesus College, Cambridge. At this time he was engaged in a most scandalous practice among the ladies at Court, with love philtres and wax images. Besides his *Grounds of the Longitude* (1591), he left behind him a mass of manuscripts, small parts of which have been published, as the *Diary* from 1564 to 1602 (J. O. Halliwell-Phillipps, 1843), and extracts from the *Book of Plays* (Halliwell-Phillipps, Folio Shakespeare, 1853-65), giving the dates of performances at the Globe Theatre of *Macbeth* (April 20, 1610) and *Winter's Tale* (May 15, 1611).

FORMA PAUPERIS, IN. In the character of a poor person—the phrase usually employed both in England and America when a person arranges to conduct an action in such a way as to avoid certain expenses because too poor to sue in the ordinary way. In England, the statutes 11 Hen. VII., c. 12, and 23 Hen. VIII., c. 15, provide that such as will swear themselves not worth £5 except their wearing apparel and the matter in question in the cause, shall be exempt when plaintiffs, but not when defendants, from the payment of court fees, and shall be entitled to have counsel and attorney assigned to them by the court without fee. They are further excused from costs when unsuccessful; a privilege which, according to Blackstone, amounted in former times only to the rather uncomfortable alternative of choosing between paying and being whipped. In the event of success, however, a person suing in this form is entitled to his costs, because his counsel and agent, and the officers of court, though they are bound to give their labor gratis to him, are not bound to give it on the same terms to his antagonist, unless he too be a pauper. To prevent the abuse of suing in the superior courts at Westminster in this form in matters of small amount, it is provided (19 and 20 Vict., c. 108, § 30), subject to certain exceptions, that any plaintiff who resorts to one of these, in a case falling within the cognizance of a county court, and recovers no more than £20, or in some cases £5, shall have no costs, unless he satisfies the court or a judge that he had sufficient reason for taking that course.

In Scotland this benevolent arrangement was introduced by statute more than half a century before the date of the English act we have mentioned.

Under similar circumstances actions *in forma pauperis* may be prosecuted in all of the United States. The provision is deemed a part of the common law of the several States, derived from the English system of administering justice, though it is now in many States governed by statute.

FORMATION (Lat. *formatio*, from *formare*, to shape, from *forma*, shape). In botany, a widespread assemblage of plants with similar life relations, whose presence is determined by climatic factors—e.g. one may speak of desert formations, or tropical evergreen forest formations. A second use of the word applies to an assemblage of similar plant societies (see Society); e.g. all the peat-bog societies of a region taken as a whole make up the peat-bog formation of that region. Many authors (as Schimper) also use the word formation as the equivalent of society; in this case the formation first described would be called climatic, in contrast to the edaphic formation or plant society. See Ecology; Distribution of Plants.

FORMATION. In geology, a term applied to a group of strata united by some character which they have in common, such as age, origin, or composition. It is loosely employed, and may be synonymous with any of the stratigraphic divisions—e.g. coal formation (Carboniferous system), Canadian formation (Canadian series), Clinton formation (Clinton stage).

FOR′MA UR′BIS (Lat., shape of the city). A famous map of Rome engraved on marble and affixed to the outer wall of the Templum Sacræ Urbis (now the Church of SS. Cosma e Damiano). The fragments were discovered under Pius IV., during excavations at the back of the church, but were carelessly kept, and some were again found in 1888, having been used to repair a garden wall. Other portions were found from 1867 to 1884, near the church, and all the fragments are now preserved in the Capitoline Museum. The map, on a scale of 1 : 250, represents the plan of the city as reconstructed under Severus and Caracalla, after the fire of Commodus, and took the place of a previous map made under Vespasian and preserved in a special building, the Templum Sacræ Urbis, facing the Forum Pacis.

FORMEDON. An ancient form of action, in the law of England, belonging to the class of real actions, whereby the heir in tail, or the reversioner or remainderman who had been ousted by a discontinuance, was entitled to vindicate his claim to the lands from which he had been ousted. By 21 James I., c. 16, it was enacted that writs of formedon should be brought within twenty years of the time when the cause of action arose. The writ of formedon is now abolished, together with other real actions.

FORMENTERA, fôr′mân-tā′rȧ. One of the Balearic Islands, situated four miles south of the island Iviza, in the western part of the Mediterranean (Map: Spain, F 3). It is a part of the Spanish Province of Baleares. The island has an area of 35 square miles, and a population, in 1900, of 2295. Wheat is chiefly grown. Formentera was taken by Aragon in 1232.

FORMER AGE, The. A poem by Chaucer, a metrical version of part of his translation of Boëthius. It was discovered by Bradshaw, and published by Morris in 1866.

FORMES, fôr′mĕs, Karl Joseph (1816-89). A German-American opera singer, born at Mülheim-on-the-Rhine. He was possessed of a remarkably sonorous bass voice and considerable dramatic talent, his début at Cologne (1841), as Sarastro, in the *Magic Flute*, at once establishing his fame. Other important European engagements were: Mannheim, 1843-48; Royal Italian Opera, London, 1852-57; on the conclusion of which he visited the United States, where, with the exception of an occasional visit to Europe, he spent the remainder of his life. The parts of Falstaff in the *Merry Wives of Windsor*, and Plunkett in *Martha*, are said to have been written for him. He was enthusiastically received throughout the United States, and especially in New York. He died in San Francisco. His brother, Theodor Formes (1826-74), was as unfortunate as Karl had been fortunate. Trained as an operatic tenor, he made a successful début at Buda in 1846, and after several important European engagements, during which he appeared successfully as Fra Diavolo, the Prophet, Robert, etc., made a tour of America with his elder brother. This tour was marred by the temporary loss of his voice, and after recovering it he fell a victim to insanity. He died in an asylum near Bonn. Like his brother Karl, he was gifted with much dramatic fervor and intuition, and a voice of great volume and compass.

FORMIA, fôr′mē-ȧ (formerly Mola di Gaeta). A city in South Italy, on the north shore of the Gulf of Gaeta, 68 miles by winding rail northwest of Naples (Map: Italy, H 6). The lower slopes of the mountains that rise behind it are covered with groves of olives, lemons, oranges, and pomegranates. The ruins of the so-called Villa of Cicero, or Villa Caposele, formerly the favorite residence of the kings of Naples, with ancient inscriptions and statues, recall the fact that in the ancient Formia was Cicero's estate of Formianum. From the upper terrace of the villa is a splendid view of the Gulf of Gaeta, the island of Ischia, and the promontories around the Bay of Naples. The harbor of Formia is visited by vessels in the coasting trade. Population, in 1881, of commune, 8600; in 1901, 8108.

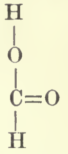
FORMIC ACID (from Lat. *formica*, ant), CH_2O_2. The simplest and one of the earliest known of the so-called fatty acids of organic chemistry. It derives its name from the circumstance of its having been first obtained from the *Formica rufa*, or red ant. In a concentrated state it is a fuming liquid with an irritating odor, and causes vesication if dropped upon the skin. If pure, it solidifies at moderately low temperatures, forming a crystalline mass that melts at 8.3° C. It boils at a slightly higher temperature than distilled water, yielding a vapor that burns with a blue flame. It is a powerful antiseptic, and acts chemically as a reducing agent; for instance, readily reducing the salts of silver, mercury, platinum, and gold. It may be obtained in various ways. For example: (1) By the distillation of red ants with water; (2) by the action of acids or alkalies upon hydrocyanic acid; (3) by the oxidation of various organic substances, such as sugar, starch, wood alcohol, etc; (4) by the action of alkalies upon chloral or chloroform; (5) synthetically (Berthelot), by keeping carbonic-oxide gas for a prolonged period in contact with potassium hydroxide at a temperature of 100° C. Kolbe and Schmitt obtained it also by the reduction of carbonic acid—a reaction of great importance, as it suggests a possible explanation of the process by which the transformation of carbonic acid into complex organic substances is effected in the organism of plants; for, since formic acid itself is a very common product of the oxidation of organic bodies, it is easy to conceive how such bodies may be formed in plants by a reversed process—that is to say, by the reduction of formic acid, and hence of carbonic acid.

The most convenient method of preparing formic acid consists in gradually adding crystallized oxalic acid to anhydrous glycerin at a temperature slightly above 100° C., oxalic acid decomposing into formic and carbonic acids according to the following equation:

$$\underset{\substack{\text{Oxalic}\\\text{Acid}}}{C_2H_2O_4} = \underset{\substack{\text{Formic}\\\text{Acid}}}{CH_2O_2} + \underset{\substack{\text{Carbonic}\\\text{Acid}}}{CO_2}$$

In the animal organism formic acid occurs not infrequently, either free or in combination; thus, it is found not only in ants, but in the poison of the bee and wasp, and in the hairs of the procession caterpillar. It has also been detected in sweat, in the expressed juice of the spleen, pancreas, thymus gland, and muscles, in the brain, the blood, and the urine.

The salts of formic acid, called *formates*, or *formiates*, are crystalline substances, soluble in water, and, if heated above 400° C., readily transformed into salts of oxalic acid. Chemically, formic acid is both an acid and an aldehyde, its molecule containing both the acid group COOH and the aldehyde group CHO:



$$\begin{array}{c} H \\ | \\ O \\ | \\ C{=}O \\ | \\ H \end{array}$$

Formic Acid

and it is to the presence of the latter group in its molecule that formic acid owes its reducing properties. See Aldehydes.

FOR′MICARI′IDÆ (Neo-Lat. nom. pl., from *Formicarius*, from Lat. *formica*, ant). The ant family. See Ant; Social Insects, under Insect.

FORMICATION (Lat. *formicatio*, from *formicare*, to crawl like an ant, to feel as if ants were crawling on one, from *formica*, ant). A peculiar sensation of partial numbness and tingling of the skin, such as might be produced by the creeping of ants or other small insects over the surface. It is one of the forms of disordered tactile sensation, or paræsthesia, and resembles the awakening from numbness, or from a limb being 'asleep.' It is sometimes a symptom of spinal disease. It may be due to pressure on a nerve, or to poisoning by aconite; in the latter case the feeling is experienced in the tongue and cheeks.

FORMIGÉ, fôr′mē′zhā′, Jean Camille (1845—). A French architect, born at Bouscat (Gironde). He studied architecture privately under J. C. Laisné, and was commissioned by the Government to prepare a series of plans and restorations of various public buildings, including the famous Roman Theatre at Orange. In 1885 he was appointed architect of streets and parks at Paris. He constructed the buildings of Liberal Arts and Fine Arts at the Exposition of 1889, and the buildings of Rumania at that of 1900. Some decorations in the town hall of Paris were also executed by him.

FORMO′SA. A Territory of Argentina, South America, occupying the northeast portion of the Republic, and lying between the rivers Pilcomayo and Bermejo (Map: Argentina, E 8). It borders on Paraguay on the northeast and east, the Chaco Territory on the south and west, and the Province of Salta on the northwest. The area is estimated at 42,000 square miles. The surface is level, with an elevation of about 350 feet, the territory forming a part of the great Chaco plain. Very little is known about the region. Its population was put in 1900 at 5589. The chief settlement is Formosa, on the Paraguay River, with about 1600 inhabitants. The town was founded after General Victorica defeated the natives of Chaco in 1884-85.

FORMOSA. A large and important island of the western Pacific, which formed part of the Empire of China until 1895, when it was ceded to Japan by the treaty concluded at Shimonoseki (q.v.). With the adjoining group of forty-seven islands known to foreigners as the Pescadores (q.v.), ceded by China to Japan by the same treaty, it forms a province of the Japanese Empire under the name of Taiwan.

Topography. Formosa lies off the east coast of China, opposite the Province of Fu-kien, from which it is distant about 90 miles. It stretches in a general northeast to southwest direction from latitude 25° 16′ to 21° 53′ N., and extends east and west from longitude 120° 15′ to 122° 5′ E. Its length is about 235 miles, and its greatest breadth 90 miles; estimated area, 13,580 square miles. Its shape is that of a long oval running to a point known as South Cape. Forty miles east of this lies the island of Botel Tobago, and a little farther north the small island of Samasana. Formosa is regarded by some as a link in the chain of volcanic islands which form the eastern escarpment of a former Malayo-Chinese continent. Along the greater part of the west coast facing China the water is shallow, while on the east coast deep water is found at once.

Throughout almost the entire length of the island, but nearer the east coast than the west, runs a great chain of forest-clad mountains, with peaks ranging from 7000 to nearly 15,000 feet in height. The two highest are Mount Morrison, called Mu-kang Shang by the Chinese, 14,360 feet, and Mount Sylvia, 11,380 feet. East of this massive backbone the country is mountainous, abruptly terminating in a precipitous coast and a few small rocky islands. Some of the cliffs present a sheer descent of from 3000 to 6000 feet. To the west of this mountainous region lies a range of low, barren clay hills, and to the west of this is a broad alluvial plain stretching from north to south, intersected here and there with water-channels, terminating in sand-banks and long muddy spits, the whole coast presenting a remarkable contrast to the bold rocky face of the east. The land on the west side is regularly gaining on the sea, owing, no doubt, to the sediment brought down from the mountains by the water-courses, especially during the rainy season, when travel in some parts of the interior is rendered almost impossible.

Climate. Except in the north, the climate during the winter is delightful. The excessive rainfall of the north, and especially in the neighborhood of Kelung, makes it unpleasantly cold, though the temperature is generally higher than in the same latitude on the mainland of China. At Tainan the atmosphere is said to be clear and bracing. On the whole, however, the climate is very trying to many. The temperature seldom rises to 100° F., but the general humidity renders even a moderate degree of heat very enervating.

Fauna. As Formosa is included within the 'Oriental' zoögeographical region, formed to include the Indo-Chinese coast and the Malayan and Chinese islands, the general characteristics of its fauna will be found under the title Oriental Region. The island has not been thoroughly explored by naturalists, though Swinhoe and others have done much investigating. Its denizens are largely the same as those of the adjacent mainland, showing that there formerly was a land connection. That the separation occurred comparatively long ago, however, is probable from the fact that the island possesses a goodly number of peculiar species, though very few, if any, are of a peculiar genus. The main departures have been in small forest-keeping birds and such small mammals as moles, flying squirrels, and mice, though a special species of goat-antelope or 'serow' (*Nemorhœdus Swinhœi*) has been developed in the mountains, and one of a forest deer (*Cervus taëvanus*), allied to Chinese and Japanese species, which the natives have half domesticated. The tiger seems never to have reached Formosa, where the largest beast of prey is the beautiful 'clouded tiger' (*Felis macroscelis*).

Mining. The interior has been but little explored, and little is known of the geology of the island. Gold is found in the streams and is worked. Bituminous coal abounds in over two-thirds of the island. The best-known mines are situated near Kelung, and are worked under foreign superintendence. Sulphur is found in great abundance, especially in the north. Petroleum and natural gas are found, but are still undeveloped. Iron and silver are also reported.

Agriculture and Industries. So far, agriculture is the chief industry of the island, and is carried on principally by the Chinese. The natural conditions are favorable to the development of that industry. Camphor, tea, and sugar are the staples of the island; but there are also produced rice, millet, corn, wheat, barley, yams, sweet potatoes, indigo, hemp, jute, peanuts, etc. The forests which cover the mountainous parts are rich in bamboo, camphor, banyan, betel-nut, and other trees. The camphor-tree, which is the most important asset of the island, as it gives to Japan a virtual control of the camphor-supply of the world, is found principally in the eastern part and in some parts of the interior. These regions are occupied chiefly by the wild tribes, and it is the policy of the Japanese Government to exploit the camphor forests without interfering with the inhabitants of the region. Since the monopolization of the camphor industry in 1899, steps have been taken for the elimination of the wasteful methods of production, which, under the old régime, had threatened the complete exhaustion of the camphor-supply of the island. Tea is grown chiefly in the northern part and sugar in the southern part of the island. The manufacturing industries are few, and confined principally to the production of sugar, camphor, mineral oil, etc.

Commerce and Transportation. Formosa has been open to foreign commerce since the Treaty of Tien-tsin (1858), which provided for the opening of the four ports of Tainan, Takow, Anping, and Tamsui. There are at present altogether thirteen ports in the island, of which those of Tamsui and Kelung get nearly three-fourths of the total commerce. The two safest harbors are those of Kelung, in the north, and Takow, in the southwest. The total value of merchandise exported from the island in 1901 was about $7,800,000, composed principally of tea, sugar, rice, camphor and camphor oil, hemp, jute, etc. The imports of merchandise for the same year amounted to nearly $10,800,000, and consisted chiefly of fruit products, opium, textiles, metals and metal manufactures, lumber, saki, cigarettes and tobacco, etc. Over 50 per cent. of the total trade is with Japan, whose imports from the island have doubled during the period of 1899-1901; next comes China, with about one-third of the total, and Great Britain and the United States, with about $1,000,000 each. The trade is carried on principally by a Chinese and a few European firms, while the commercial influence of Japan is confined to the trade in camphor, opium, and salt—all Government monopolies. The total shipping amounted in 1900 to about 210,000 tons, mostly in British and Chinese bottoms. The island has only one bank, the Bank of Formosa, a private corporation under Government supervision, with a capital of about $2,500,000, and the right of issuing notes, whose circulation, however, is confined to the island. The construction of means of transportation and communication is being pushed by the Japanese Government with great rapidity. A trunk line, from Takow in the southwestern part of the island to Kelung in the north, has been more than half completed. In 1900 the two lines connecting Kelung with Sin-chu or Tek-cham (60 miles), and the line from Takow to Tainan (26 miles), were open for traffic.

Government and Finance. The island is under the administration of a military Governor-General, who is responsible to the Cabinet at Tokio. He is assisted by a council. The civil Governor, who resides at Tai-pei, is responsible for the civil administration. Formosa and the Pescadores are divided, for administrative purposes, into seven districts, of which three are known as *kens*, or prefectures of first rank, and the other four as *chos*, or prefectures of the second class. The judicial code of the island is different from that of Japan. The finances are still in an unsatisfactory condition, owing to the unsettled state of the island, which necessitates the maintenance of a large military force. The budget of the colony for 1900-01 balanced at about $11,000,000, and the subvention from the mother country was estimated in that year at about $4,500,000. The revenue is derived chiefly from monopolies. Japanese schools are being established all over the island. In 1902 there were over 16,000 native pupils in Japanese schools.

Population. According to the census of 1897 the population of the whole province numbered 2,797,543 persons, of whom 52,405 were in the Pescadores; 16,321 were Japanese. In December, 1898, the figures were 2,729,503, exclusive of resident Japanese and the aborigines.

Ethnology. The population consists of three elements: (1) The Japanese, who, apart from the garrisons, are mostly officials, teachers, traders, and fishermen; (2) the aboriginal tribes and clans; and (3) the Chinese settlers, chiefly from the provinces of Fu-kien and Kwang-tung on the mainland. These occupy the plain which borders the west coast, and the regions of the north. The Hakkas (q.v.) form an important feature of this part of the population. They live in villages of their own, and carry on the greater portion of the barter trade with the aborigines. Until comparatively recent times no official was allowed within their inclosures.

So little is known regarding the aboriginal inhabitants of Formosa that the question of their relationship is very obscure. When the early Chinese settlers arrived in Formosa, some time after the year 1430, they approached it by the west coast, where they found many tribes of savages. Those first encountered they designated Pepohwan, 'Barbarians of the level plain.' These were gradually dispossessed and driven eastward to the low hills which flank the mountains on the west. They have acquired a certain amount of civilization, and speak Chinese. The males for the most part dress like the Chinese, and in religious matters follow the Chinese, though they still retain many of their original notions and practices. Inheritance is through the mother. By the Chinese they are now designated *Sek-hwan*, 'cooked' or 'tamed barbarians,' as distinguished from the *Chi-hwan*, 'raw' or 'untamed barbarians,' whose habitat is in the mountains beyond, and in the south. These are divided into many tribes and clans, with a great variety of languages and dialects, and preserve in their wild independence their ancient customs and institutions—bodily ornaments and mutilations, tattooing, head-hunting, spirit and nature worship, etc. They live in villages, have houses of stone roofed with great slabs of slate, and are remarkably neat and clean. Those living on the hillsides build houses of bamboo, grass, and mud. Order prevails everywhere, and in marriage matters they are very strict. Often a large house is provided outside the village where the unmarried men sleep. They cultivate millet and other crops.

History. Chinese records speak of an expedition against Formosa undertaken as early as the year 603. Japanese adventurers are said to have landed and made conquests in it in the twelfth century, and we are told that from the fifteenth century the eastern or aboriginal half was officially considered by the Japanese as a part of their empire. The first Europeans to visit the island were Portuguese. This was in 1590. The Spanish attempted to hold a part of the island, but were driven out by the Dutch, who had gained a footing in the Pescadores in 1621. In 1624 the Dutch occupied a point near Taiwan, where they built a fort and a town which they called Zeelandia, began commercial operations on a great scale, opened schools, and inaugurated mission work. When in 1620 the persecution of native Christians broke out in Japan, large numbers of them fled to Formosa and formed a colony, but later dwelt with the Dutch until the latter were forced in 1662 to withdraw, as the result of many conflicts with the Chinese settlers, and with Koxinga (q.v.), the famous pirate, who succeeded in making himself King of the island. After a brief and stormy reign his successor was dethroned by the Manchu Emperors. The opening in 1858 of Formosa to foreigners was an important event in the history of the island. Roman Catholic missions were established in 1859, Protestant missions in 1860, and by 1864 a prosperous foreign trade had been established. The aborigines, however, continued to give trouble. As the result of the murder of a number of Japanese sailors by the natives, China was appealed to for redress, but disclaimed responsibility for the acts of the savages. In 1874 the Mikado sent a punitive expedition under General Saigo. On the protest of the Peking Government, however, the Japanese retired, but only on conditions secured in Peking by the Japanese envoy—Soyeshima (q.v.)—that China should reclaim and govern eastern Formosa, and pay the expense incurred by Japan. In 1884 Kelung was taken by the French under Admiral Courbet and held until June, 1885.

One result of the Chino-Japanese war over Korea, in 1894-95, as specified in the Treaty of Shimonoseki (q.v.), was the cession of Formosa to the Mikado's officers, June 2, 1895. The Chinese officials on the island, summoning the Black Flag General, Liu, to their aid, declared a 'republic.' Forthwith the Japanese Imperial guard of 7000 men was dispatched, the rebellious republic was duly crushed, and the natives were chastised. Then began the costly occupation and development. Outbreaks have been frequent, but order is being rapidly evolved from the complicated conditions of races and interests.

Bibliography. This is extensive, but it may be simplified by consulting Henri Cordier's *Bibliographie des ouvrages relatifs à l'Isle Formose* (Chartres, 1803). The works of the early annalists contain much that is both useful and curious. See Imbault-Huart, *L'Isle Formose* (Paris, 1893). For those who can read French, this is an excellent work to refer to. Other general works on Formosa are: Campbell, *Missionary Success in Formosa* (London, 1889); Mackay, *From Far Formosa: the Island, Its People and Missions* (New York, 1896); *Geschichte Formosa bis Anfang 1898* (Bonn, 1898); Swinhoe, *Notes on the Island of Formosa* (1863). Mr. Swinhoe was a naturalist. Le Gendre, "Account of a Visit to the Southern Tribes," in *United States Commercial Relations for 1868-69;* House, *The Japanese Expedition to Formosa* (Tokio, 1875). The astonishing literary imposture may also be consulted: Balmanazar, *Description of Formosa* (London, 1705). Davidson, *The Island of Formosa* (1902), is the most recent work on the subject.

FORMOSAN DEER. A species of deer (*Cervus taëvanus*) peculiar to the mountains of Formosa, and frequently caught in traps by the people and tamed as a pet. It is one of the 'sika' group, which includes the spotted deer of Japan and others of Manchuria. It is lighter in color than the others, while the spots have a tendency to persist during winter; and the tail is white with a black stripe down the middle of its upper side. See Sika.

FORMO'SUS. Pope, 891-896. He was born about 816, probably in Rome, and first appears in history as Cardinal Bishop of Porto (864); he was sent on an embassy to the Bulgarians by Nicholas I. in 866, and trusted with important missions by Adrian II. Having sided with the German faction against John VIII., he was excommunicated and banished; but on taking an oath never to return to Rome, or again to assume his episcopal functions, he was readmitted as a layman to the rites of the Church (878). From this oath he was absolved by Marinus, the successor of John VIII., and restored to his dignities (883); and on the death of Stephen VI., in 891, he was chosen Pope. The Italian faction had chosen Sergius; and the election of Formosus, which was in opposition to an old rule against the translation of bishops from one see to another, could not be confirmed without violence, but he was rendered secure for a time by the success of the arms of Arnulf of Germany. After the withdrawal of Arnulf, Formosus was compelled to grant the Imperial crown to Lambert, son of Guido of Spoleto; but this act did not pacify the Italian faction, and Formosus was released from very hard straits only by the arrival of Arnulf, who captured Rome in the end of 895. In the following year Arnulf was crowned Emperor by Formosus, who died soon after. His successor, Stephen VII., had his body disinterred and treated with contumely as that of a usurper of the Papal throne; but Theodorus II., in 897, restored it to Christian burial, and at a synod presided over by John IX., in 898, the pontificate of Formosus was declared valid and all his acts confirmed.

FORMS, or Quantics. In mathematics, rational, algebraic, integral, homogeneous functions of r variables, $x_1, x_2, x_3, \ldots x_r$, the degree of these variables being the order of the form. If $r=2$ there results a binary form; if $r=3$, a ternary, etc., terms due to Gauss (1801). Symbolically, a binary form may conveniently be represented by $f(x_1, x_2) = \sum_{r=0}^{n} \binom{n}{r} a_r x_1^{n-r} x_2^{r}$. With algebraic forms is connected the study of invariants and covariants, the whole subject being sometimes called, by the English, the theory of quantics, or modern higher algebra. The theory was first extensively investigated by Gauss (q.v.), although Lagrange had already studied the invariant property of the discriminant (Sylvester, 1852; Gauss had called it the determinant, 1801) $a_0a_2 = a_1^2$, of the quadratic form $a_0x^2 + 2a_1xy + a_2y^2$, finding, namely, that it is unaltered by substituting $x + \lambda y$ for x. To Boole (1841) is due the discovery of the invariant property of the discriminant of every binary form. Eisenstein, Hesse, Aronhold, and Clebsch in Germany, Cayley and Sylvester in England, and Brioschi in Italy, have been among the most prolific contributors to the theory. The best historic survey is that of Franz Meyer, "Bericht über den gegenwärtigen Stand der Invariantentheorie," in *Jahresbericht der deutschen Mathematiker-Vereinigung*, vol. i. (Berlin, 1892). The most important treatises upon the subject are: Cayley's "Memoirs upon Quantics," in the *Philosophical Transactions* (London, 1854 et seq.); Salmon, *Modern Higher Algebra* (Dublin, 1859, and enlarged later editions); Fiedler, *Die Elemente der neueren Geometrie under der Algebra der binären Formen* (Leipzig, 1862); Clebsch, *Binäre Formen* (Leipzig, 1872); Faà di Bruno, *Formes binaires* (Turin, 1876; Leipzig, 1881); Gordan, *Invariantentheorie* (Leipzig, 1887); Elliot, *Algebra of Quantics* (Oxford, 1895). The most recent digest of the theory, with bibliography and historical notes, is Meyer, "Invariantentheorie," in the *Encyklopädie der mathematischen Wissenschaften*, vol. i. (Leipzig, 1899).

FORMS OF ACTION. The approved classes into which actions are divided under the common-law system of pleading and practice. They had their origin in the use of original writs, which were mandatory letters or processes issuing in the King's name, containing a statement of the alleged injury, and directing the sheriff to first command the defendant to satisfy the claim, and, on his failure to do so, to summon him into court to answer and defend the complaint made against him. Many of these writs were of remote antiquity, some of them antedating the Conquest, and others being shaped by the clerks and judicial officers of the Norman kings. They were drafted in fixed and certain forms, providing remedies for the more ordinary and obvious civil wrongs. These writs were limited in number; and where an injured person could not make the facts of his case fit the allegations of a known writ, he was wholly without remedy, as there was no other way in which he could get his cause before the court. Thus they had the effect of limiting and defining the right of action itself, and for this reason the enumeration of writs and causes of action became identical. This condition of affairs was somewhat relieved by the introduction of curious and arbitrary legal fictions, whereby an old writ was made to do service for a new cause of action. Thus, there being no form of action for the recovery of goods unlawfully detained by a tort-feasor, the action in trover, originally devised to permit the recovery of lost goods from the finder, was without change of form made available for the more general purpose. For example, if A, having B's goods in his possession, wrongfully withheld them from B, the writ would allege that B had casually lost the goods and A had found them, but, although knowing them to be the goods of B, had refused to deliver them to him. B was not required to prove this fiction, but could show the true circumstances, which might be that he had given A the goods to store for him, to be returned on demand, and that A had converted them to his own use.

A further important modification of the ancient forms of action was effected by a statute enacted in the reign of Edward I., which provided that where the facts of a new case were similar to those covered by a known writ, the clerks of Chancery (q.v.) should have power to frame a new writ to meet the exigencies of the case. This caused an increase in the number of writs, and consequently in forms of action, the new forms being known as actions on the case, i.e. actions in similar cases (*in consimili casu*), and contributed very greatly to making the common-law system more efficient in the administration of justice. Notwithstanding these changes, forms of action have always remained inflexible and insufficient for the relief of many civil wrongs, and this inflexibility has been a potent cause of the growth of equity jurisdiction.

The following were the principal forms of action at common law: Assumpsit, Covenant, Debt, Account, Trespass, Trover, Case, Detinue, Replevin, Ejectment, and Writ of Entry. They have been abolished in England by the Judicature Acts (q.v.), and in several of the United States have been superseded by modern forms of action instituted by codes of procedure; but they are still in use with some changes and modifications in some jurisdictions. See ACTION; COMMON COUNTS; COMMON FORMS; PLEADING; PRACTICE.

FORMS OF ADDRESS. In those countries where gradations of rank and title prevail there is great complexity in the forms of address. As

PERSONAGE	Address of Letter to	Beginning of Letter to and reference to
Archbishop	His Grace the Lord Archbishop of ——	My Lord Archbishop; your Grace.
Baron	The Right Hon. Lord ——	My Lord; your Lordship.
Baron's son	The Hon. John ——	Sir.
Baron's daughter	The Hon. Mary —— (If married, the Hon. Mrs. ——)	Madam.
Baronet	Sir John ——, Bart.	Sir.
Baronet's wife	Lady ——	Madam.
Bishop	The Right Rev. the Lord Bishop of ——; or simply, The Lord Bishop of ——	My Lord; your Lordship.
Countess	The Right Hon. the Countess of ——	Madam; your Ladyship.
Daughter of Duke, Marquis, Earl	The Lady Mary ——	Madam; your Ladyship.
Duchess	Her Grace the Duchess of ——	Madam; your Grace.
Duke	His Grace the Duke of ——	My Lord Duke; your Grace.
Earl	The Right Hon. the Earl of ——	My Lord; your Lordship.
Eldest son of Duke, Marquis, Earl	Uses the second title of his family, and is by courtesy addressed as though he held the title by law.	
King	His [Most Gracious] Majesty the King	Sire; your Majesty.
Knight	Sir John —— (If a knight commander of any order, its initials follow name, as K.C.B., K.C.S.I.)	Sir.
Knight's wife	Like baronet's wife.	
Lord Lieutenant (of Ireland)	His Excellency the Lord Lieutenant	According to rank.
Lord Mayor *	The Right Hon. the Lord Mayor	My Lord; your Lordship.
Maid of Honor	The Hon. Mary S ——	Madam.
Marchioness	The Most Hon. the Marchioness of ——	Madam; your Ladyship.
Marquis	The Most Hon. the Marquis of ——	My Lord; your Lordship.
Members of Parliament	The letters M.P. are added to their usual address.	
Officers in the Army and Navy	Their rank in the service, if above subaltern, is prefixed to any other rank.	
Prince	His Royal Highness the Prince of ——, or Prince ——; or (if the prince is a duke) His Royal Highness the Duke of ——	Sir; your Royal Highness.
Princess	Her Royal Highness the Princess of ——, or the Princess ——, or the Duchess of ——	Madam; your Royal Highness.
Privy Councilor	The Right Hon. —— ——	
Queen	Her Majesty the Queen	Madam; your Majesty.
Viscount	The Right Hon. Viscount ——	My Lord; your Lordship.
Viscountess	The Right Hon. Viscountess ——	Madam; your Ladyship.
Youngest son of Duke or Marquis	The Lord John ——	My Lord; your Lordship.
Youngest son of Earl or Viscount	The Hon. ——	Sir.

* The title 'Lord Mayor' is confined to the chief magistrate of London and a few of the larger cities—until recently York and Dublin alone.

those which are most often practically useful, the ceremonious modes of addressing letters to titled personages in England are given above. It must be understood that in nearly all cases these forms are employed only where strict formality is requisite, as from complete or comparative strangers. In informal conversation it is nowhere the custom of persons of good social position to use the strict forms here given unless there are personal or professional reasons for it. Thus, for example, a very young man of good manners, speaking to an aged and distinguished peer, or a clergyman to his bishop, may call him 'My Lord'; but the King or the Prince of Wales is usually addressed by persons with whom he is acquainted simply as 'Sir,' the Queen as 'Ma'am,' a duke as 'Duke,' other peers and their wives as 'Lord ——' and 'Lady ——.'

Forms of address in the United States are not so rigidly governed by custom as in the older or monarchical countries, but it is well to know that common usage has sanctioned the following forms:

The President of the United States, Governors of States, and ambassadors and ministers to foreign countries are addressed as 'His Excellency' (the President of the United States, etc.).

The Vice-President, heads of executive departments at Washington, Justices of Supreme or Superior Courts, Lieutenant-Governors of States, Mayors of cities, etc., 'The Hon. —— ——' (Vice-President of the United States, etc.).

Senators and Representatives of the United States, or of the several States, 'The Hon. —— ——,' to which may be added their official designation.

Ex-Presidents or other former officials of the above-mentioned ranks are commonly addressed as 'The Hon. —— ——.'

Archbishops: 'The Most Rev. the Archbishop of ——.' (If a cardinal, 'His Eminence the Cardinal Archbishop of ——.')

Bishops in the Roman Catholic or Episcopal Churches: 'The Right Rev. the Bishop of ——,' or 'The Right Rev. —— ——.' In the Methodist Church, 'The Rev. Bishop. ——.'

The use of the term 'Esquire' was at one time largely confined in America to addressing lawyers; but of late years the English practice which attributes it to any gentleman of position not possessing another title has been gaining ground, although 'Mr. —— ——' is still a very common usage.

FOR'MULA, Chemical. See Chemistry.

FORMULA OF CONCORD. See Concord.

FORNARINA, fôr'nȧ-rē'nȧ, La. See Raphael; Sebastiano del Piombo.

FOR'NEY, John Weiss (1817-81). An American journalist and politician. He was born at Lancaster, Pa., and at the age of sixteen entered the printing-office of the Lancaster *Journal*. Four years later he purchased the Lancaster *Intelligencer*, and in 1840 he became proprietor of the *Journal*, and combined the two papers under the name of the *Intelligencer and Journal*. In 1845 his appointment by President Polk as deputy surveyor of the port of Philadelphia took him to that city, where he purchased a half interest in the *Pennsylvanian*, a Democratic paper of great influence, which under his editorial control attained a national importance. In 1851 he was chosen clerk of the United States House of Representatives, serving until 1855. During his service at Washington he edited the *Union*, the organ of the Northern Democrats. In 1855 he headed the Pennsylvania delegation to the National Convention at Cincinnati, and was largely instrumental in securing the nomination of Pennsylvania's candidate, Buchanan. In August, 1857, he established the Philadelphia *Press*. Though at first a Douglas Democrat, Forney became, in the latter days of the Buchanan Administration, a pronounced Republican, and contributed largely to the organization of that party and its early successes. Elected a second time clerk of the National House of Representatives in 1859, he removed to Washington, and began the publication of the *Sunday Morning Chronicle*, which in 1862 was changed to a daily, and was throughout the Civil War looked upon as the particular organ of the Lincoln Administration. After serving as secretary of the United States Senate from 1861 to 1868, he disposed of his interest in the *Chronicle* and returned to Philadelphia, where in 1871 he was made Collector of the Port by President Grant. He was an earnest promoter of the Centennial Exposition, and visited Europe in its interest in 1875. In 1877 he sold the *Press* and established a weekly, the *Progress*, which he edited until his death. In 1880 he left the Republican Party and supported Hancock for the Presidency. He published *Letters from Europe* (1869); *What I Saw in Texas* (1872); *Anecdotes of Public Men* (2 vols. 1873); *Forty Years of American Journalism* (1877); *Life of Winfield Scott Hancock* (1880); and *The New Nobility* (1882).

FORNICATION (*fornicatio*, from *fornix*, an arch-vault, and by metonymy a brothel, because brothels in Rome were in cellars and vaults under ground). The illicit carnal intercourse by an unmarried person with one of the opposite sex, whether married or unmarried. In most countries this offense has been brought within the pale of positive law at some period of their history, and prohibited by the imposition of penalties more or less severe; but it is now usually left to the restraints which public opinion imposes on it in every community which is guided by the principles of morality and religion. In England, in 1650, during the ascendency of the Puritan party, the repeated act of keeping a brothel, or committing fornication, was made felony without benefit of clergy on a second conviction. At the Restoration this enactment was not renewed; and though notorious and open lewdness, when carried to the extent of exciting public scandal, continued, as it had been before, an indictable offense at common law, the mere act of fornication itself was abandoned 'to the feeble coercion of the spiritual court.' In a few of the United States the offense is made a misdemeanor by statute, punishable by fine and imprisonment, but in most of the States the common-law rule prevails. Consult the authorities referred to under Criminal Law.

FOR'REST, Edwin (1806-72). An American tragedian, long the most famous that our stage had produced. He was born in Philadelphia, March 9, 1806, of Scottish and German descent. Already he had attracted attention in amateur theatricals when, November 27, 1820, he made his first regular appearance at the Walnut Street

Theatre, in Philadelphia, in Home's *Douglas*. By diligence and close study he rose in the profession, and in 1826, at the Park Theatre, New York, made a decided triumph in *Othello*. Thenceforward his career was one of distinction, both in this country and in England, where he made his first appearance at Drury Lane in *The Gladiator* in 1836. There in 1837 he married Catharine, the daughter of John Sinclair, the singer. In later years he became jealous of her, and the trial by which, in 1852, he obtained a divorce was one of the most celebrated cases of the time. His quarrel with Macready was another affair which did him little honor. Much of the odium that has been cast upon him for the Astor Place Riot in New York (1849), which was ostensibly in favor of Forrest against his English rival, was certainly undeserved; for that unfortunate outbreak was really one of the episodes of the native American movement of the period; but Forrest's relation to the matter was far from dignified. Though he lost the favor of many of the best people, his success upon the stage was, nevertheless, uninterrupted. He had already made a fortune, and built a castle upon the Hudson, called 'Fonthill'; later he established himself in a home in Philadelphia. His last professional appearance was in 1871. He died December 12, 1872, from apoplexy, after an illness of half an hour, and in his will left a large portion of his ample estate to found a home for aged and destitute players.

Forrest has been called essentially a melodramatic actor. His robust physique and voice made the assumption of sentimental parts almost impossible. In Shakespeare his best rôles were Richard III., Lear, Coriolanus, and Othello, but he was even more effective in Virginius, Metamora, Spartacus, Damon, and characters of that range. His personal disposition was impetuous and frank, though marred at times by jealousy and an excessive opinion of his own merits. His scholarship in the line of his profession was good, and he gathered a splendid library, in which the Shakespearean collection was famous. Consult: Barrett, *Edwin Forrest* (Boston, 1882); Alger, *Life of Edwin Forrest, the American Tragedian* (Philadelphia, 1877); Rees, *The Life of Edwin Forrest, with Reminiscences and Personal Recollections* (Philadelphia, 1874).

FORREST, French (1796-1866). An American naval officer, born in Maryland. He distinguished himself as a midshipman in the War of 1812, and was present at the battle of Lake Erie. In 1817 he became a lieutenant, in 1837 was promoted to be commander, and in 1844 to be captain. During the Mexican War he served as adjutant-general of the naval and land forces. He joined the Confederate side at the outbreak of the Civil War, was appointed to the command of the navy yard at Norfolk, and subsequently became Acting Assistant Secretary of the Confederate Navy.

FORREST, Sir John (1847—). An Australian explorer and politician, born in Western Australia. He entered the survey department of that colony in 1865, in 1869 commanded an expedition to the interior in search of Dr. Leichardt, and in 1870 led an exploring expedition from Perth to Adelaide. In 1874 he commanded a second exploring expedition, from Champion Bay on the west coast to the overland telegraph line between Port Darwin and Adelaide, a distance of about 2000 miles. He was appointed Deputy Surveyor-General of Western Australia in 1876, and Commissioner of Crown Lands and Surveyor-General in 1883. From 1890 to 1901 he served as first Premier and Treasurer of Western Australia under a responsible form of government. He was also Postmaster-General of Australia in 1900-01, and in 1897 was elected President of the Federal Council of Australia. In 1901 he became Minister of State for Defense for the Commonwealth of Australia. The gold medal of the Royal Geographical Society of London was awarded to him in 1876. His publications include: *Explorations in Australia* (1876), and *Notes on Western Australia* (1884-87).

FORREST, Nathan Bedford (1821-77). An American soldier, distinguished as a cavalry leader on the Confederate side during the Civil War. He was born near the site of Chapel Hill, Tenn., on July 31, 1821; removed with his father, a blacksmith, to Tippah County, Miss., in 1834; attended school for only about six months altogether; joined an uncle in the horse and cattle trading business at Hernando, Miss., in 1842; later became a slave-trader at Memphis, Tenn., and by 1859 had accumulated a considerable fortune. Though at first opposed to a dissolution of the Union, he entered the Confederate Army as a private in June, 1861, soon after the outbreak of the Civil War, and in July was called upon by Governor Harris of Tennessee to organize a battalion of cavalry, of which, in October, he became lieutenant-colonel. Soon afterwards he was ordered to Fort Donelson, where he remained until Grant's attack, and with Floyd escaped on the night of February 15-16, 1862, leaving Buckner to surrender on the following day. (See Fort Donelson.) On July 21, 1862, he was promoted to be brigadier-general, and thereafter served in Kentucky for some time under General Bragg. He was transferred to northern Mississippi in November, 1863, was promoted to be major-general on December 4th of that year, and in November of the following year was placed in command of all the cavalry with the Army of the Tennessee. On January 24, 1865, he was placed in command of the cavalry in Alabama, Mississippi, and east Louisiana; on February 28th became a lieutenant-general; in March was defeated at Selma, Ala., by Gen. J. H. Wilson; and in May surrendered at Gainesville, his troops being included in the arrangement made by Gen. Richard Taylor with General Canby. In the North he became unfavorably known as the leader of the Confederates at the so-called 'massacre of Fort Pillow,' though he uniformly denied the charges that were brought against him. (See Fort Pillow.) After the war he worked his plantation for a time, was president from 1868 to 1874 of a company which endeavored without success to build a railroad between Memphis and Selma, and subsequently until his death conducted two large plantations, one on President's Island and the other in Shelby County, Tenn. During part of the Reconstruction period he is said to have been at the head of the Ku-Klux Klan (q.v.). Consult: Jordan and Pryor, *Campaigns of Nathan B. Forrest* (New York, 1868); Wyeth, *Life of General Nathan Bedford Forrest* (New York, 1899); and Mathes, *General*

Forrest (New York, 1902), one of the "Great Commanders Series."

FORREST CITY. The county-seat of Saint Francis County, Ark., 90 miles east by north of Little Rock; on the Saint Louis, Iron Mountain and Southern and the Choctaw, Oklahoma and Gulf railroads (Map: Arkansas, E 2). It is the centre of a fertile agricultural and stock-raising district, and has manufactures of spokes, cottonseed oil, etc. Population, in 1890, 1021; in 1900, 1361.

FOR′RESTER, Alfred Henry (1804-72). An English artist, whose pen-name was Alfred Crowquill. Born in London, he was educated at a private school in Islington, and became associated in business with his elder brother, a notary, but retired in 1839. At the age of twenty he began to contribute to various periodicals, and afterwards practiced drawing and modeling, wood and steel engraving. He contributed sketches to *Punch*, the *Illustrated London News*, other periodicals, and several annuals; exhibited pen-and-ink sketches at the Royal Academy (1845-46), and illustrated many books, six of which he wrote himself. *Phantasmagoria of Fun* (1843) is representative of his best work, and some of his other publications are: *A Bundle of Crowquills* (1854); *The Comic Arithmetic* (1844); *The Book of Ballads* (1849, with Doyle and Leech). His elder brother, Charles Robert (1803-50), also employed the name of Alfred Crowquill. Charles was for a time on the staff of the *New Monthly Magazine* and *Bentley's Miscellany*. He was the author of several novels and tales.

FORRESTER, Fanny. The pseudonym of Miss Emily Chubbuck, who became the wife of Adoniram Judson, the American missionary. See Judson, Emily Chubbuck.

FORSBERG, fôrs′bĕr-y′, Niels (1841—). A Swedish painter, born at Riseberga, Skåne. The son of a peasant, he spent his early years in farming, then was apprenticed to a house-painter at Göteborg. Dabbling in sculpture, he fashioned a statue of Minerva good enough to procure for him a Government stipend which enabled him to go to Paris in 1867. There his true vocation was discovered to be for painting, and he became the pupil of Bonnat. The siege of Paris, during which he enlisted in the Ambulance Department, afforded him many opportunities for studying and sketching the stirring scenes that came under his observation. In 1878 he exhibited "An Acrobat Family," now in the Museum at Göteborg, but his finest production, "The Hero's Death" (1888), for which he was awarded the great gold medal, is in the National Museum at Stockholm. Afterwards he devoted himself more especially to historical subjects.

FORSETE, fôr-sĕt′e, or **FORSETI,** fôr-sĕt′ē (Icel., Fore-seated). The son of Balder, and the god of Justice, in Norse mythology.

FORSH′EY, Caleb Goldsmith (1812-81). An American engineer, born in Somerset County, Pa. He was educated at Kenyon College, Ohio, and at West Point, but left the latter institution in 1836 before graduating, and became professor of mathematics and civil engineering at Jefferson College, Miss. He was engaged in engineering work in the Southwestern States for several years, was engineer in charge of the Government survey of the Mississippi River delta from 1851 to 1853, and from 1853 to 1855 was chief engineer of the Galveston, Houston and Henderson Railroad. From 1855 to 1861 he was principal of the Texas Military Institute. On the outbreak of the Civil War he joined Sam Houston in actively opposing the secession movement in Texas in public meetings and in conventions. After the secession of the State, however, he offered his services to the Confederacy, and was commissioned a lieutenant-colonel of engineers, in which capacity he performed valuable services both in Virginia, where he served on the staff of General Magruder, and in Texas. After the war he engaged in railway engineering and in work on the Mississippi River and its branches. He was one of the authors of *The Physics of the Mississippi River* (1861).

FORSKÅL, fôr′skạl, Peter (1732-63). A Swedish botanist. He was born at Helsingfors, studied at Göttingen, and was professor at Copenhagen. In 1761 he took part in a scientific expedition to Egypt and Yemen, where he collected several hundred plants which had previously been unknown. Seized with an attack of the plague, he died on his journey in Arabia. Among his publications are: *Dubia de Principiis Philosophiæ Recentioris* (1756); *Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, Vermium, quæ in Itinere Orientali Observavit Petrus Forskal* (1775); and *Flora Ægyptiaco-Arabica* (1775). The genus *Forskalia* is named in his honor.

FORSSELL, fôrs′sĕl, Hans Ludwig (1843-1901). A Swedish historian and statesman, born at Gefle. He was educated at the University of Upsala, where he became a lecturer in 1866. In 1875-80 he was Finance Minister in the Council of State, and from 1888 president of the Exchequer. From 1879 to 1897 he was a member of the Upper House of the Riksdag. He largely assisted in the establishment of the gold standard for Swedish currency, and wrote *Studier och Kritiker* (1875-88), collections of essays; *Sveriges inre historia fran Gustaf I.* (1869-75); and *Anteckningar ur Sveriges jordbruksnäring i 16 seklet* (1884).

FORST, fôrst. A town in Brandenburg, Prussia, on the Neisse, 44 miles south of Frankfort-on-the-Oder (Map: Prussia, F 3). It has tanneries, and manufactories of woolen cloth and buckskin. Forst was founded in the thirteenth century. It has belonged to Prussia since 1815. Population, in 1890, 23,500; in 1900, 32,075.

FORSTEMANN, fẽr′ste-män, Ernst Wilhelm (1822—). A German philologist, born in Danzig. In 1865 he became chief librarian at the Royal Library in Dresden. His services in behalf of the reorganization of the Dresden Library were most important. His principal publications include: *Altdeutsches Namenbuch* (2 vols.; 2d ed. vol. i., 1900; 2d ed. vol. ii., 1872), a valuable and interesting work devoted to a discussion of old German proper names, the volumes being respectively devoted to names of persons and places; *Geschichte des deutschen Sprachstamms* (1874-75), his most important work; *Aus dem alten Danzig, 1820-40* (1900); and an edition of, as well as several interesting treatises on, the famous Maya manuscript in the Dresden library.

FÖRSTER, fẽr′stẽr, August (1822-65). A German anatomist, born at Weimar. He was educated at Jena, and subsequently held professorships at Göttingen (1852-56) and Würzburg (1856-65), where his investigations on pathological histology and teratology gave him a wide celebrity. His chief publications include: *Lehrbuch der pathologischen Anatomie* (10th ed. 1875); *Atlas der mikroskopischen pathologischen Anatomie* (1854-59); *Grundriss der Encyklopädie und Methodologie der Medizin* (1857).

FÖRSTER, Ernst (1800-85). A German art critic and painter, brother of Friedrich Christoph, the historian and poet. He was born near Camburg, Saxe-Meiningen, April 8, 1800, and at first applied himself to the study of theology and philosophy, but soon devoting himself to art, entered the studio of Peter Cornelius at Munich. He was employed in painting the frescoes in the Aula at Bonn, and those of the Glyptothek and the arcades at Munich; but his reputation rests chiefly on his discovery of several ancient pictures, and on his works on the history of art. His greatest discovery was the frescoes of Avanzo, which date as far back as 1376, in the Chapel of San Giorgio at Padua. Among his paintings are "Hellas Liberated," and portraits of the Duke and Duchess of Altenburg and children. Among his frescoes are scenes from Goethe's poems, and scenes from Wieland's *Musarion* and *Die Grazien*, Royal Palace, Munich. Among his works are excellent guide-books to Munich, Italy, and Germany; *De Wandgemälde der Sanct Georgenkapelle zu Padua* (1859); *Vorschule der Kunstgeschichte* (1862); *Denkmale deutscher Baukunst, Bildnerei und Malerei* (1853-69); *Geschichte der deutschen Kunst* (1851-60); *Geschichte der italienischen Kunst* (1869-78); *Peter von Cornelius* (1874). Most of these works were illustrated by woodcuts after his own designs. He wrote a life of Jean Paul Richter, who was his father-in-law, and edited several of his works. He died at Munich, April 29, 1885.

FORSTER, fôr'stâr', François (1790-1872). A French engraver, born at Locle, Switzerland. He studied in Paris under the engraver Langlois, and then entered the Ecole des Beaux-Arts, where he won the Grand Prix de Rome in 1814. He engraved a number of historical subjects and portraits which have given him some reputation. Among these are: "Francis I. and Charles V. Visiting the Church of Saint Denis" (1833, after Gros); "The Madonna of the House of Orleans" (1838, after Raphael); and the portraits of Raphael, Humboldt, Wellington, and others.

FÖRSTER, fẽr′stẽr, Franz (1819-78). A German jurist. He was born at Breslau, and in 1874 was appointed director in the Ministry of Ecclesiastical Affairs. He assisted in the compilation of the new Prussian Code of Judicial Procedure, and wrote several standard works on Prussian law, which include: *Preussisches Grundbuchrecht* (1873), and *Theorie und Praxis des heutigen gemeinen preussischen Privatrechts* (7th ed. 1896-97).

FÖRSTER, Friedrich Christoph (1791-1868). A German historian and poet, brother of Ernst, the painter. He was born near Camburg, Saxe-Meiningen, and studied theology at Jena, but subsequently devoted his attention for a time chiefly to archæology and the history of art. On the uprising of Prussia against France in 1813 he joined the Lützow sharp-shooters together with Theodor Körner, and, like him, wrote spirited war-songs, many of which appeared in his *Gedichte* (1838). At the close of the war he was appointed professor in the school of engineering and artillery in Berlin, but on account of certain democratic writings he was dismissed in 1817. He then became connected with various literary journals, among them the *Neue Berliner Monatsschrift* and the *Vossische Zeitung*, and in 1829 was made curator in the Royal Museum of Berlin. His writings include: *Albrecht von Wallenstein* (1834); *Gustav Adolf* (1833), an historical drama; *Preussens Helden in Krieg und Frieden* (1846), a severely criticised history of Prussia from 1640 to 1815; and a partial autobiography published posthumously in 1873, under the title *Kunst und Leben*.

FOR′STER, Georg (1754-94). A German traveler and naturalist, born near Danzig. When seventeen years old he accompanied his father, Johann Reinhold Forster, in Captain Cook's voyage around the world, and on his return collaborated with him in an account of it, written in English, and entitled *Observations Upon a Voyage Around the World* (2 vols., 1777). After some time spent in Paris, where he made the acquaintance of Franklin, he accepted a professorship of natural history at Cassel in 1779, and in 1784 was appointed to a similar position at Vilna. In 1787 he was called to Russia by Catharine II. to undertake a voyage of discovery, which was abandoned on the outbreak of the Turkish War. In the following year he accepted the office of librarian to the Elector of Mainz. After the taking of Mainz by the French in 1792, Forster, who had become an enthusiastic republican, went to Paris as the representative of the city, to secure its incorporation in the Republic. In the recapture of Mainz by the Prussians in the next year he lost his library and collections, and determined to remain in Paris, where he died in 1794, while preparing to make an extensive trip to East India. Besides numerous briefer works on scientific subjects, he wrote *Kleine Schriften: ein Beitrag zur Länder- und Völkerkunde, Naturgeschichte und Philosophie des Lebens* (1879-97); and *Ansichten vom Niederrhein, von Brabant, Flandern, Holland, England und Frankreich* (1790-91). His letters were published by his wife, Therese, afterwards Therese Huber (2 vols., 1829), and his complete works edited by his daughter, with a characterization of the author by Gervinus (1843). For his *Life*, consult: König (Leipzig, 2d ed., 1858) and Leitzmann (Halle, 1893).

FÖRSTER, fẽr′stẽr, Heinrich (1800-81). A German Roman Catholic prelate. He was born at Grossglogau, was educated at Breslau, and in 1837 was appointed chief preacher at the Cathedral of Breslau. In 1853 he was elected Bishop. At the numerous synods and councils which he attended he revealed himself as a stanch defender of the orthodox Roman Catholic creed, although he opposed the dogma of infallibility at the Council of the Vatican. In 1875, after repeated conflicts with the Prussian May laws (q.v.), he was deposed from his see. He was a famous pulpit orator. His principal works are: *Der Ruf der Kirche in die Gegenwart* (4th ed. 1879); *Die christliche Familie* (6th ed. 1893); *Kardinal Diepenbrock. Ein Lebensbild* (3d ed. 1878); *Gesammelte Kanzelvorträge* (5th ed. 1879).

FOR′STER, Johann Reinhold (1729-98). A German traveler and naturalist. He was born in Dirschau, was educated for the clerical profession at Halle, and in 1753 became pastor at Nassenhuben, near Danzig; but devoted most of his time to mathematics and the natural sciences. In 1765 he accepted an offer made to him by the Russian Government to inspect and report upon the new colonies founded on the banks of the Volga. His irritable temper soon involved him in difficulties with the Russian Government, and in the following year he repaired to England and became teacher of natural history at Warrington, Lancashire. In 1772 he was invited to take part in Cook's second expedition to the South Seas. In 1777 he published, in collaboration with his son, his *Observations upon a Voyage Around the World*, containing the information he had gathered in course of that voyage. In the same year he returned to Germany, and in 1780 became professor of natural history and mineralogy at Halle. Besides the above work, he published *Zoologia Indica* (1781), and *Geschichte der Schiffahrt und Entdeckungen im Norden* (1784).

FOR′STER, John (1812-76). An English political and historical writer, born at Newcastle. He was educated for the bar, but early devoted himself to periodical writing. His political articles in the London *Examiner*, for which he began writing in 1832, attracted unusual attention, owing to their vigor and outspoken honesty. In 1846 he succeeded Dickens as editor of the *Daily News*, but resigned the next year to assume the editorship of the *Examiner*, a post which he held for nine years. He is the author of many admirable biographical and historical essays dealing with the statesmen and the times of the English Commonwealth. Among them are: *Lives of the Statesmen of the Commonwealth* (1836-39); *The Debates on the Grand Remonstrance* (1860); *Arrest of the Five Members* (1860); *Sir John Eliot: A Biography* (1864). His literary memoirs are also excellent. The chief are: *The Life and Adventures of Oliver Goldsmith* (1848, enlarged, with a slight change in the title—*Life and Times of Oliver Goldsmith*—1854); *Walter Savage Landor* (1869); *The Life of Charles Dickens* (1872-74); and the first volume of a *Life of Swift* (1876). Forster's style is clear and forcible. He was appointed Secretary to the Commissioners in Lunacy in 1855, and a Commissioner in Lunacy in 1861.

FÖRSTER, fẽr′stẽr, Karl (1784-1841). A German poet. He was born at Naumburg, a son of Johann Christian Förster, preacher in the cathedral in that city. After studying theology and philosophy at Leipzig he was appointed professor of the German language and literature at the Military Academy in Dresden in 1807. He completed Wilhelm Müller's *Bibliothek der deutschen Dichter des 17ten Jahrhunderts*, and wrote many poems, several of which have been set to music. They were collected and published in 1843. His translations from the classic poets of Italy are also justly celebrated.

FÖRSTER, Ludwig von (1797-1863). A German architect, born at Bayreuth. He is chiefly remarkable for the impetus he gave to German and Austrian architecture by the foundation in 1836 of the *Allgemeine Bauzeitung*, a review devoted to that subject. Among the buildings erected by him in Vienna are the synagogue in the Leopoldstadt (1838) and the Protestant Church of Gumpendorf (1849). He was also architect for the Elizabeth bridge. All his work is in and near Vienna, and is executed in Renaissance style.

FÖRSTER, Richard (1843—). A German archæologist. He was born at Görlitz, and was educated at Jena and Breslau. In 1899 he was appointed professor of archæology at the University of Breslau. His works include: *Der Raub und die Rückkehr der Persephone in ihrer Bedeutung fur die Mythologie; Litteratur und Kunstgeschichte* (1874); *Farnesina-Studien* (1880); *Scriptores Physiognomici Græci et Latini* (1893).

FÖRSTER, Wendelin (1844—). An Austrian philologist and Romance scholar, born at Wildschütz, Bohemia, and educated in Vienna. He was professor at Prague from 1874 to 1876, and at Bonn after 1876. One of his most noteworthy achievements has been the definite establishment of the Breton origin of the Arthurian legend. His numerous publications of the older French writers include: *Elie de Saint Gille* (1876-82); *Li Chevaliers as deus espees* (1877); *Altfranzösische Bibliothek*, vols. i.-xi. (1879-87); *Romanische Bibliothek*, vols. i.-xvii. (1888-1900); *Die sämmtlichen Werke von Christian von Troyes*, vols. i.-iii. (1884-90).

FÖRSTER, Wilhelm (1832—). A German astronomer, born at Grünberg, Silesia. He studied at Berlin and Bonn, and became professor of astronomy at Berlin in 1863, and director of the observatory in 1865. In 1868 he was also appointed director of the commission established by the North German Confederation, and continued from 1871 by the German Empire, for the determination of standards of measurement. In this capacity he superintended the reorganization of the German system of weights and measures on the metric basis. He was elected president of the International Bureau of Weights and Measures in 1891. In 1892 he assisted in founding the German Society for Ethical Culture. His publications include: *Populäre Mitteilungen* (2 vols., 1879 and 1884); *Sammlung von Vorträgen und Abhandlungen* (2 vols., 1887 and 1890); and *Studien zur Astronometrie* (1888).

FOR′STER, William (1784-1854). An English philanthropist, born at Tottenham, near London. He became a preacher in the Society of Friends, labored as such in the United States, England, and France, and in 1846 went to Ireland to relieve the distress there caused by famine. In 1849 he was commissioned by the Quaker Yearly Meeting in London to present an address on slavery and the slave trade to rulers of the Christian nations, and within the next few years he had interviews with nearly all the monarchs of Europe, with the President of the United States, and with the Governors of a number of the Southern States. Consult Seebohm (editor), *Memoirs of the Life of William Forster* (2 vols., London, 1865).

FORSTER, William Edward (1818-86). An English statesman, the only son of William Forster, the Quaker missionary. He was born at Bradpole, Dorsetshire, was educated in Friends' schools at Bristol and Tottenham, and entered the woolen business at Bradford in 1841, where in the following year he formed a partnership with William Fison in that business, which continued to the end of his life. In 1861 he was elected from Bradford to the House of Commons, and continued to hold his seat by successive reëlections until his death. Forster at once took a prominent part in Parliamentary debates, and came to be looked upon as one of the principal leaders of the advanced Liberals. He took every opportunity of speaking on the question of the reform of the suffrage, and on the outbreak of the Civil War in America, with Cobden and Bright, earnestly opposed every attempt to recognize the Confederacy, and denounced the Government's action in permitting vessels of the *Alabama* type to be built and fitted out in English ports. In 1865 he became Under-Secretary for the Colonies in Lord Russell's Ministry, and in 1868 was appointed by Gladstone vice-president of the Council on Education and a Privy Councilor. In 1869, in spite of opposition from Radicals both in the Church of England and among Dissenters, he secured the passage of the Endowed Schools Bill, and in 1870 introduced the most famous legislative measure connected with his name, the Elementary Education Bill, which is the foundation of the existing national system of education in England. In 1872 he introduced and piloted through the House of Commons the Ballot Bill. In the Gladstone Ministry of 1880, against his own inclination, he accepted the position of Chief Secretary for Ireland. During the winter of 1881-82 several attempts were made on Forster's life by the 'Invincibles,' but he remained resolutely at his post. When, however, in May, 1882, a majority of the Cabinet determined upon the release of Parnell and the other imprisoned leaders, Forster and Lord Cowper, the Lord Lieutenant, who protested against such action, resigned. Although Forster continued to take part in the debates in Parliament, and was reëlected as a Liberal by his constituents in November, 1885, he acted on many questions independently of his party, and was opposed to the Gladstone Home Rule programme. Consult Reid, *Life of the Right Hon. W. E. Forster* (5th ed., London, 1889).

FORSYTH′, Andrew Russell (1858—). An English mathematician, born at Glasgow. He was educated at Liverpool College, and at Trinity College, Cambridge, where he was senior wrangler and first Smith's prize man. He was made fellow of Trinity in 1881, was professor of mathematics at University College, Liverpool, from 1882 to 1883, and lecturer in Trinity College, Cambridge, from 1884 to 1895. He was made a fellow of the Royal Society in 1886, and succeeded Cayley as Sadlerian professor of pure mathematics at Cambridge in 1895. His principal publications are: *Treatise on Differential Equations* (1885); *Theory of Differential Equations* (1890, 2d ed. 1901); *Theory of Functions of a Complex Variable* (1893, 2d ed. 1900). He has also published numerous memoirs on differential equations and the theory of functions, in the *Transactions of the Cambridge Philosophical Society* and in the *Philosophical Transactions of the Royal Society* (London).

FORSYTH, George Alexander (1837—). An American soldier, born at Muncy, Pa. At the outbreak of the Civil War he enlisted as a private in the Chicago Dragoons. He fought throughout the war successively in the Army of West Virginia, that of the Potomac, and that of the Shenandoah, and was four times wounded in service. He rose to be brevet brigadier-general of volunteers in 1865, was brevetted lieutenant-colonel United States Army, in 1867 (for gallantry at Dinwiddie Court House), and lieutenant-colonel of the Fourth United States Cavalry in 1881. He also obtained the brevet of brigadier-general in the Regular Army in 1868 for conduct in battle with hostile Indians. In 1875-76 he was a member of the board of officers appointed to inspect the armies of Europe and Asia, and from 1866 until his retirement for wounds in 1890 was on staff and frontier service. He published *Thrilling Days in Army Life* (1900) and *The Story of the Soldier* (1900).

FORSYTH, James W. (1836—). An American soldier, born in Ohio. He graduated at the United States Military Academy in 1856, in the Civil War served as captain on the staff of Major-General McClellan during the Peninsular and Maryland campaigns, was brevetted major for gallant services at Chickamauga, and in 1864-65 was assistant adjutant-general of volunteers and chief of staff of Major-General Sheridan. In 1865 he had attained the rank of brigadier-general of volunteers, and brevet brigadier-general United States Army. He was assistant inspector-general of the Department of the Gulf in 1866-67, and in 1869-73 was aide to Lieutenant-General Sheridan. From 1873 to 1878 he was military secretary of the Division of the Missouri, in 1886 became colonel of the Seventh United States Cavalry, in 1894 brigadier-general, and in 1897 was retired with commission as major-general. He published a *Report of an Expedition Up the Yellowstone River* (1875).

FORSYTH, John (1780-1841). An American politician. He was born at Fredericksburg, Va., graduated at Princeton in 1799, and in 1802 was admitted to the bar at Augusta, Ga. He was appointed Attorney-General of the State in 1808, and in 1812 was elected to Congress. He was reëlected in 1814 and 1816, and in 1818 was chosen United States Senator, a position which he held only until the following year, when he was sent by President Monroe to represent the United States as Minister to Spain. While at Madrid he successfully concluded the negotiations which resulted in the sale of Florida to the United States. On his return to the United States in 1822 he was again elected to Congress, and was reëlected in 1824. In 1827 he was elected Governor of Georgia, and on the conclusion of his term of office was for a second time sent to the United States Senate. His advocacy of Jackson's measures and policy won for him in 1834 the appointment of Secretary of State in the latter's Cabinet, in order to accept which he resigned his seat in the Senate. He served as head of the State Department during the remainder of Jackson's Administration, and was continued in office through the entire Administration of President Van Buren, whose friendship he had won in 1831 by ably supporting him when the Senate refused to confirm his nomination as Minister to England. He retired from office with the close of the Administration in 1841, and died the same year.

FORSYTH, Sir THOMAS DOUGLAS (1827-86). An Anglo-Indian legislator. He was born at Birkenhead, and was educated at Sherborne and Rugby. After a distinguished career in India he was in 1860 appointed commissioner in the Punjab, and in 1872 he was intrusted with the task of suppressing the insurrection at Malair Kotla. In the following year he was appointed envoy to Kashgar, and in 1875 was sent in the same capacity to the King of Burma to effect a settlement of the question of the Karens.

FORSYTH, WILLIAM (1812-99). An English author, born at Greenock, England, and educated at Trinity College, Cambridge, where he took his M.A. in 1837. He studied law at the Inner Temple, and began practice in 1839. From 1859 to 1872 he was standing counsel to the Secretary of State for India, and from 1874 to 1880 was a member of Parliament from Marylebone. In the early part of his life his authorship consisted almost entirely of legal works, some of which are of great value, and are considered authorities on the subjects which they treat. He was editor of the *Annual Register* from 1842 to 1868. His published works include: *On the Law of Composition with Creditors* (1841); *The Law Relating to Simony* (1844); *The Law Relating to the Custody of Infants* (1850); *Hortensius* (1849), an historical survey of the law from the earliest times; *History of Trial by Jury* (1852); *History of the Captivity of Napoleon at Saint Helena* (1853); *Civil Liberty and Self-Government* (1856); *Life of Marcus Tullius Cicero* (1863); *Cases and Opinions on Constitutional Law* (1869); *Novels and Novelists of the Eighteenth Century* (1871); *Hannibal in Italy* (1872), an historical drama in verse; *History of Ancient Manuscripts* (1872); *Essays, Critical and Narrative* (1874); and *The Slavonic Provinces South of the Danube* (1876).

FORSYTHIA, fŏr-sĭth′ĭ-ȧ (Neo-Lat., named in honor of William Forsyth, a Scotch botanist). A genus of shrubs of the order Oleaceæ. *Forsythia viridissima* and *Forsythia suspensa*, small Chinese shrubs now commonly cultivated under the names golden-bell and golden-rain, are hardy, and noticeable for their yellow flowers, which appear before the leaves in the spring.

FORT. See FORTIFICATION.

FORT AD′AMS. A United States military post, established in 1841, and situated about three miles from the mouth of Narragansett Bay, upon Brenton's Point, the southern boundary of the entrance to the harbor of Newport, R. I. The site of this fort is said to have been occupied for defensive purposes during the American Revolution, and a permanent work of the same name was first garrisoned in 1799. The Government reservation comprises 138½ acres, 21½ of which are covered by the fort proper. In 1902 it was the headquarters of an artillery district, and had a garrison of four companies.

FORTALEZA, fôr′tȧ-lā′zȧ, or **CEARÁ.** The capital of the State of Ceará, Brazil, situated on an open bay, near the mouth of the Rio Ceará (Map: Brazil, K 4). It is regularly built, with broad and well-paved streets, and is one of the most beautiful cities of Brazil. Though surrounded by a sterile region, it is connected by rail with fertile inland sections. The harbor is subject to constant silting and presents difficulties of access for large vessels; still Fortaleza ranks as the chief port of the State, and has an active trade in rubber, cotton, drugs, coffee, sugar, and animal products. Fortaleza dates from 1611, when a fort was here established by Amparo to hold the Indians in check and to prevent the Dutch from gaining a foothold in this vicinity. The city is the residence of a United States consular agent. Population, in 1890, 40,902.

FORT ANN. A village in Washington County, N. Y., 12 miles north by east of Fort Edward; on the Champlain Canal, and on the Delaware and Hudson Railroad (Map: New York, G 2). It is a summer resort, and has manufactures of knit goods and pulp. Population, in 1900, 431. A fort was built here by Colonel Nicholson on his futile expedition against Canada in 1709, and was rebuilt in 1757 and named Fort Ann. In 1758, during the French and Indian War, Captain Robert Rogers defeated near here a somewhat smaller force of French and Indians under Marin; and in 1777, during the Revolutionary War, a small force of Americans under Colonel Long, fleeing from Ticonderoga, was defeated here by a force of British, who occupied the partly burned fortifications. Fort Ann was incorporated as a village in 1820.

FORT BLISS (Tex.). A United States military post, originally established in 1868, on the Rio Grande, three miles northeast of El Paso, Tex., and distant from Santa Fé 350 miles. It stands on a reservation of 1265 acres purchased in 1890, and is designed for a garrison of four companies of cavalry or infantry. Post-office and telegraph station are located at the post.

FORT BOW′YER. A fort, formerly situated on Mobile Point, at the entrance to Mobile Bay. It was built by General Wilkinson in April, 1813, was garrisoned by General Jackson with 160 men under Major William Lawrence, and on September 14, 1814, was unsuccessfully attacked by a small naval and land force under Capt. W. H. Percy. On February 8, 1815, after the battle of New Orleans, it was again attacked by the British, this time by a superior land force, and on the 11th it surrendered. Consult: Adams, *History of the United States*, vol. viii. (New York, 1889-91); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT CAN′BY. A United States military post, established in 1864, on the north side of the mouth of the Columbia River, Washington. It was originally called Fort Cape Disappointment, but the name has since been changed to Canby in honor of the distinguished officer of that name, killed by the Modoc Indians. Its garrison consisted in 1902 of two companies of coast artillery. There are post-office and telegraph stations at the post, and communication is had by steamer and Northern Pacific Railroad with Portland, Ore., 114 miles, and Seattle, Wash., 222 miles.

FORT CASWELL, kăz′wĕl. A United States military post, established 1825, on Oak Island, N. C., 22 miles from Wilmington, N. C., and two miles from Southport. There is a post-office and telegraph station at the post, which comprises 2325 acres. The garrison consists of four companies of artillery.

FORT CHIP′PEWY′AN, or **CHIPEWAYAN.** A trading station of the Hudson Bay Company at the southwest end of Lake Athabasca, Canada, opposite the mouth of the Athabasca River (Map: Northwest Territory, G 3). It is one of the most populous of the far northern stations, owing to the location here of a mission containing about one hundred hardy orphans, sent thither to be trained as future colonists.

FORT CHURCH'ILL. A trading station of the Hudson Bay Company, at the mouth of the Churchill River on the west shore of Hudson Bay (q.v.) (Map: Northwest Territory, L 3).

FORT CLARK. A United States military post, established 1852, on Las Moras Creek, near Brackettville, Tex., which is the post-office. The reservation comprises 3963 acres; it is 125 miles west of San Antonio on the Southern Pacific Railroad. It is intended for the protection of the southwest frontier and Mexican border, and has quarters and stables for a regiment of cavalry or infantry.

FORT CLIN'TON. A Revolutionary fort on the Hudson, near West Point, intended to make the river impassable for the British fleet in 1777.

FORT COL'LINS. A city and the county-seat of Larimer County, Colo., 74 miles north of Denver; on the Cache la Poudre River, and on the Colorado and Southern Railroad (Map: Colorado, E 1). It has a public library, and is the seat of the State Agricultural College, opened in 1879. The city is the centre of one of the most fertile regions of the State, watered by extensive and efficient systems of irrigation, and is engaged chiefly in agriculture and stock-raising, but has good water-power and some manufactures. Population, in 1890, 2011; in 1900, 3053.

FORT COLUM'BUS. A United States military post, established in 1806 on Governor's Island, in the harbor of New York, 1000 yards south of Manhattan Island. The island in 1902 comprised 65 acres, upon which are the fort proper, with quarters for four companies of artillery or infantry, Castle William (military prison), and the headquarters of the Department of the East and of the Military Service Institution of the United States. Governor's Island was first occupied by the Dutch, who called it Nutten Island; afterwards, under the English rule, it was a perquisite of the royal Governors, from which fact it derived its name. In 1710 it became a quarantine station. In 1775 the island was first fortified and occupied successively by the American and the British troops. From 1784 to 1794 it was used as a summer resort and race-course. In 1797, under the fear of war with France, steps were taken to strengthen the defenses here. In 1800 the island was deeded to the United States by the Legislature, and in 1806 a permanent fortification was built by Colonel Jonathan Williams, of the United States Engineers, upon the site of Fort Jay, an early earthwork. In 1812 the 'South Battery' was added to the defenses. At the present time (1902) the garrison consists of four companies of coast artillery. Extensive improvements were begun in 1901, which comprise doubling the area of the island, the erection of new docks, numerous warehouses, barracks, and officers' quarters for the accommodation of a regiment of infantry. For illustration of Castle William, see FORTIFICATION.

FORT D. A. RUS'SELL. A United States military post in Wyoming, established in 1867, and occupying a reservation of 4400 acres on a branch of the South Platte River, three miles from Cheyenne, on the Union Pacific Railroad. It was named after Gen. D. A. Russell, U. S. V., who was killed in the battle of Opequan, September 19, 1864. There are barracks for eight companies of infantry, and post-office and telegraph stations at the post.

FORT DEAR'BORN. A fort built on the site of Chicago in 1804-05, well known from a massacre which occurred near by, on August 15, 1812. On that day the garrison of 67 men, under Capt. Nathan Heald, evacuated the fort, under orders from Gen. William Hull, and, accompanied by the resident settlers, some thirty in number, including women and children, started for Detroit under the escort of a body of Miami Indians. At a short distance from the fort they were attacked by an ambushed force of about 500 Indians, assisted by most of the escort, and two-thirds of their number were killed and the rest captured. Most of the captives were subsequently ransomed at Detroit. The fort was destroyed on the following day by the Indians, was rebuilt about 1816, was evacuated in 1823, was reoccupied in 1828, and was demolished in 1856. Consult: Wentworth, *Early Chicago, Fort Dearborn* (Chicago, 1881); Kirkland, *The Chicago Massacre of 1812* (Chicago, 1893); an interesting narrative in Kinzie, *Wau-bun, or the Early Day, in the Northwest* (Chicago, 1857); and the version, largely from the Indian standpoint, in an article, "The Massacre of Fort Dearborn, Gathered from the Traditions of the Indian Tribes Engaged in the Massacre," by Simon Pokagon, in *Harper's Magazine*, vol. xcviii. (New York, 1899).

FORT DE FRANCE, fôr de fräɴs (formerly Fort Royal). The capital of Martinique (q.v.), situated on the western coast of the island (Map: West Indies, R 7). It has a good harbor and is strongly fortified. In 1902 Fort de France became important as the distributing centre for supplies during the terrible eruptions of Mont Pelée (q.v.). Population, in 1896, 17,800.

FORT DE L'ÉCLUSE, fôr de lā'klụz'. A fortress in the French Department of Ain, about 14 miles south of Geneva (Map: France, M 5). It was erected by the dukes of Savoy, but was repeatedly destroyed by the Swiss during the sixteenth century. Rebuilt by Vauban at the command of Louis XIV., it was dismantled by the Austrians in 1815. Since 1824 it has been restored and strengthened. It occupies a crag 1385 feet high, at the foot of Mont Credo, which commands the passage of the Rhône from Switzerland through the defile of the Ecluse.

FORT DODGE. A city and the county-seat of Webster County, Iowa, 87 miles north by west of Des Moines; on the Des Moines River, and on the Illinois Central, the Chicago, Rock Island and Pacific, and two other railroads (Map: Iowa, C 2). It is an important railroad centre, and has great natural advantages. In the vicinity are vast coal-fields that employ over 2000 men, large deposits of glass-sand and excellent clay, and quarries of brown sandstone. The city has extensive manufactures of stucco and plaster, paints, brick and tile, foundry products, oatmeal, pottery, etc. There are also greenhouses with a large wholesale trade, and repair-shops of the four railroads which enter the city. Fort Dodge maintains a public library and owns the waterworks system. Population, in 1890, 4871; in 1900, 12,162.

FORT DONELSON. See Fort Henry and Fort Donelson.

FORT DOUG′LAS. A United States military post in Utah, established in 1862, and occupying a reservation of 9250 acres at the base of the Wahsatch Mountains, 5030 feet above the sea. There is a post-office at the post, and a telegraph station at Salt Lake City, three miles distant. It is 37 miles from Ogden on the Union Pacific Railroad, and has quarters for 500 cavalry or infantry.

FORT DU PONT. A United States military post in Delaware occupying a reservation of 173 acres opposite Pea Patch Island, in New Castle County. The nearest post-office and telegraph station are at Delaware City, Del. The garrison in 1902 included two companies of coast artillery.

FORT DU QUESNE, dụ′kân′. See Pittsburg.

FORTE, fôr′tâ. In music, the Italian term for loud; *fortissimo*, as loud as possible. In scores these expression marks are designated respectively by f and ff. Occasionally a double fortissimo (fff) is required, especially in piano arrangements of orchestral works.

FORT ED′WARD. A village in Washington County, N. Y., 55 miles north of Troy; on the Delaware and Hudson Railroad (Map: New York, G 2). By means of a dam at this point the Hudson furnishes good water-power, and the village has extensive paper and pulp mills, a shirt-factory, a brewery, a pottery, etc. It is the seat of the Fort Edward Collegiate Institute. First incorporated in 1849, Fort Edward is governed under a charter of 1857, which provides for a mayor, chosen annually, and a village council, elected on a general ticket. The water-works are owned and operated by the municipality. Population, in 1900, 3521.

The site of Fort Edward was known to the French and English in the latter part of the seventeenth century and the early part of the eighteenth as the Great Carrying Place. In 1709 Colonel Nicholson, while on his unsuccessful expedition against Canada, built a stockade on the spot. This fell into decay, but in 1755, during the French and Indian War, another fort, called Fort Lyman at first, but soon renamed Fort Edward in honor of the Duke of York, was erected here. In 1757 the survivors of the Fort William Henry massacre took refuge within its walls. Throughout the French and Indian War and the Revolution, the fort was the starting-point for expeditions against Canada. In 1777 it was for some time the headquarters of General Schuyler, and later was occupied by General Burgoyne. Near here, on July 27, 1777, Jane McCrea (q.v.) was killed by the Indians. Consult: Parkman, *Montcalm and Wolfe* (Boston, 1884), and an article, "Fort Edward in 1779-80," in the *Historical Magazine*, 2d series, vol. ii. (Boston, 1867).

FORTEGUERRI, fōr′tâ-gwĕr′rê, Niccolò (1674-1735). An Italian poet, born at Pistoja. Being a younger son, he was destined for the Church, and in 1695 he was sent to Rome to his uncle, Cardinal Fabroni. He accompanied an embassy to Spain, and, now in favor and again disgraced, occupied successively many ecclesiastical offices, being secretary of the Propaganda when he died. During his life only a few of his rhymes and prayers were published. His more important works, the *Capitoli* (of which the first edition, under the title of *Rime piacevoli*, appeared in 1765-67), the *Epistole poetiche*, and the satirical epic *Il Ricciardetto* (1738), which he wrote under the pseudonym Cartermaco, were not given to the press until after his death. We owe to him also a blank-verse translation into Italian of the comedies of Terence (1736). In his original works, which, as the form shows, are largely improvised, the satirical element predominates, and bitter attacks upon the monastic orders are not infrequent. Consult the edition of Forteguerri's works in the *Classici italiani* (Milan, 1813), to which is prefixed an Italian translation of Fabroni's biography in Latin; Procacci, *Niccolò Forteguerri e la satira toscana de' suoi tempi* (Pistoja, 1877); Camici, *Notizie della vita e delle opere di Niccolò Forteguerri* (Siena, 1885); Zacchetti, *L'elemento imitativo nel Ricciardetto* (Reggio, Calabria, 1892); Zaccagnini, *L'elemento satirico nel Ricciardetto* (Pistoja, 1895).

FORT E′RIE. A fort, formerly situated in Canada, at the head of the Niagara River, opposite Buffalo, N. Y., on the site of the present village of the same name (population, in 1900, 1000); the scene of considerable fighting in the War of 1812. It was abandoned and partially destroyed by the British on May 28, 1813, and in the succeeding two months was occupied alternately by the Americans and the British. On July 3d it was captured, with a garrison of 170 men, by the American General Jacob Brown (q.v.), and after the battle of Lundy's Lane, July 25, 1814, the whole American army, numbering about 2000 men, was withdrawn thither by General Ripley, who was soon replaced by General Gaines. The British under General Drummond advanced to attack, and from August 7th to August 14th kept up an almost constant bombardment. On November 5, 1814, the fort was blown up by the Americans, and it was never subsequently rebuilt. Consult: Adams, *History of the United States*, vols. vii. and viii. (New York, 1889-91); and Dawson, *Battles of the United States* (New York, 1858).

FOR′TESCUE, Chichester Samuel. See Carlingford, Chichester Samuel Fortescue, Baron.

FORTESCUE, Hugh, third Earl Fortescue (1818—). An English author and politician, born in London and educated at Harrow and at Trinity College, Cambridge. Lord Melbourne made him his private secretary in 1840. In 1841 he was elected a member of Parliament, and sat continuously until shortly before he succeeded to his father's title and took his seat in the House of Lords (1861). He was a Lord of the Treasury in 1846-47, and secretary of the Poor Law Board from 1847 to 1851. In politics he identified himself with the Liberal-Unionists. He wrote: *Lectures on the Health of Towns* (1845); *Official Salaries* (1851); *Representative Self-Government for London* (1854); *Public Schools for the Middle Classes* (1864); and *Our Next Leap in the Dark* (1884).

FORTESCUE, Sir John (c.1394-c.1476). An English judge. He came of an old Devonshire family and received his education at Exeter College, Oxford. He was King's sergeant-at-law in 1441, and in the following year became Chief Justice of the King's Bench. It is known, from many records of the time, that in the early part of his career Fortescue was popular as a judge, but later fell into disfavor, because he belonged to the Court party; hence he also supported Henry VI. against Richard of York, and later against Edward IV. Many of his works were written to support the Lancastrian claims. Until the final defeat of the House of Lancaster at Tewkesbury, in 1471, he shared all their fortunes; and during the wanderings abroad, where Fortescue seems to have received the empty title of Chancellor from Henry VI., he wrote, for the instruction of young Prince Edward, his celebrated work, *De Laudibus Legum Angliæ*, a masterly eulogy of the laws of England. At Tewkesbury he fell into the hands of Edward IV., who pardoned him. He died at an advanced age, but the date has not been ascertained. A valuable and learned work by Fortescue, written in English, discussing the differences between an absolute and limited monarchy, was reëdited by Plummer in 1885, under the title *The Governance of England.* His other works are numerous, but have little interest. Consult: Plummer, introduction to *The Governance of England* (Oxford, 1885); Gairdner, *The Paston Letters* (London, 1872-75); Clermont's edition of Fortescue's works, in which all writings attributed to Fortescue are published (London, 1869).

FORTESCUE, Sir JOHN (c.1531-1607). An English statesman and Chancellor of the Exchequer. He was a son of Sir Adrian Fortescue, and a great-grandson of Sir John, the Chief Justice. His father was executed when John was eight years old; but the son—possibly educated at Oxford—had his property restored by an act of Parliament in 1551. During Mary's reign his mother was in favor, and he was appointed instructor to the Princess Elizabeth. On the accession of Elizabeth, he was made keeper of the great wardrobe. He entered Parliament in 1572; in 1589 succeeded Mildmay as Under-Treasurer and Chancellor of the Exchequer, a very lucrative post, and in 1601 became Chancellor of Lancaster. This post in the Exchequer he lost when James came to the throne, but the patents for the other two offices were reissued, and he twice entertained the King. In 1604 he was candidate for the seat for Buckinghamshire in an election declared void by the Court of Chancery, and was returned on a second election. The Commons challenged the right of Chancery to decide in such a case, and after compromise on a third election Fortescue was returned in 1606. He died a little less than two years later.

FORT E′THAN AL′LEN. A United States military post in Vermont, established in 1892, and occupying a reservation of 761 acres. The post-office is Essex Junction, Vt., distant two miles, and the nearest telegraph station is Burlington, Vt. (six miles away). There are quarters for 800 men, cavalry and artillery, and stables for 600 horses.

FORT FISH′ER. An earthwork in North Carolina, on the peninsula between the Atlantic Ocean and Cape Fear River, defending the entrance to the port of Wilmington. In the last year of the Civil War this was almost the only port open to the Confederates, and it became a matter of importance to the Federals to close it. To this end a formidable fleet under Admiral Porter left Hampton Roads on December 13, 1864, and arrived in sight of the fort on December 20th. At 1.40 A.M. on the 24th, the powder-boat *Louisiana*, laden with 215 tons of powder, was exploded within 200 yards of the beach and 400 yards of the fort, but the latter sustained no appreciable damage. Later in the day the fleet opened fire, and in a little over an hour the guns of the fort were silenced. On the 25th the bombardment was renewed in order to cover the landing of the land forces under Gen. Benj. F. Butler, but though a reconnoitring force went within 150 yards of the fort, an assault was deemed unadvisable, and the troops reëmbarked and returned to James River. The fleet, however, remained near the fort, and on January 13, 1865, another military force of 8000 men, under command of Gen. A. H. Terry, was landed. The bombardment was renewed on the 13th and 14th, and on the 15th a joint assault of soldiers, sailors, and marines carried the fort, capturing more than 2000 prisoners and 169 guns. The Union loss was 266 killed and 1018 wounded. Early on the 16th a magazine explosion, probably the result of an accident, killed more than 100 of the Federals and about as many of the Confederates. The Confederates then blew up their remaining works, the control of the mouth of Cape Fear River passed from their hands, and Wilmington was evacuated. Consult: Ammen, *The Atlantic Coast* (New York, 1883); and Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. iv. (New York, 1887).

FORT GAINES. See MOBILE POINT.

FORT GAINES. A town and the county-seat of Clay County, Ga., in the southwestern part of the State; on the Chattahoochee River and on the Central of Georgia Railroad (Map: Georgia, A 4). It is the centre of a cotton and fruit-growing region, and has cottonseed-oil mills, brick-yards, etc. Population, in 1890, 1097; in 1900, 1305.

FORT GAR′RY. See WINNIPEG.

FORT GEORGE. A fort, formerly situated on the Canadian side of the Niagara River almost opposite Fort Niagara (q.v.), and in the village of Newark (now Niagara). On May 27, 1813, it was taken by an American force under the actual command of Col. Winfield Scott and Commodore Perry (the commanding officer, General Dearborn, being ill). On December 10th the fort was evacuated by General McClure, to avoid an attack by a superior British force. Consult: Dawson, *Battles of the United States* (New York, 1858); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT GETTY, gĕt′tĭ. A United States military post on Sullivan's Island, S. C., north of the main entrance to Charleston Harbor and nearly opposite to Fort Sumter. The post-office is Moultrieville, S. C., and the telegraph station Charleston, S. C. There were, in 1902, on the reservation, which comprises 16 acres, permanent quarters for 12 officers and 250 artillerymen, and temporary accommodations for 225 men.

FORT GRANT. A United States military post in Arizona occupying a reservation of

42,341 acres, and originally called 'Camp Grant.' It is situated 2500 feet above the sea, at the junction of the Arivaypa with the San Pedró River, 56 miles north of Tucson, and was established about 1863 by the California Volunteers as a protection against the Apaches to the southern line of travel to California. There are quarters and stables for six troops of cavalry. A post-office and telegraph station is located at the post.

FORT GRE'BLE. A United States military post occupying a reservation of 80 acres on Dutch Island, R. I., at the western entrance to Narragansett Bay, 3½ miles north of Beaver Tail, 4½ miles west of Newport. The post-office is Jamestown, R. I., and the telegraph station Newport, R. I. The garrison in 1902 consisted of two companies of coast artillery. The post is named after Lieutenant Greble, United States Army, killed at the battle of Big Bethel, Va., in 1861.

FORT GRISWOLD, grĭz'wold, Conn. See GROTON.

FORTH. A river and estuary of Scotland. The river is formed by the junction near Aberfoyle of two main headstreams, the Duchray Water, 16 miles long, and the Avondhu, 12 miles long, which rise in the mountains between Lochs Katrine and Lomond in the northwest of Stirlingshire (Map: Scotland, E 3). It traverses a country rich in romantic scenery. From Aberfoyle the Forth winds 39 miles southeasterly to Stirling, and at Alloa, 12 miles beyond, widens into the Firth of Forth (Map: Scotland, F 3). The Firth extends 6 miles southeast, then, with an average breadth of 2½ miles, continues 10 miles to Queensferry, where it contracts to a mile in width and is spanned by the celebrated cantilever railway bridge, opened in 1890. The Firth extends 36 miles farther to the North Sea, expanding in width to 15 miles. The river is navigable to Alloa by vessels of 300 tons, and to Stirling by vessels of 100 tons. A canal 38 miles long connects it with the Clyde. It has important salmon and herring fisheries.

FORT HAM'ILTON. A United States post, established in 1831, and occupying a reservation of 167 acres on the southwest shore of Long Island. It is one of the principal defenses of New York City, commanding 'the Narrows.' The post-office and telegraph station is Fort Hamilton, N. Y. There are quarters for 650 men and stables for 200 horses. During the American Revolution the British landed here prior to the battle of Long Island, 1776.

FORT HAN'COCK. A United States military post established in 1892, occupying a reservation of 1366 acres at Sandy Hook, N. J., and commanding one of the entrances to New York Harbor. There are post-office and telegraph stations at the post. It was named after Major-General Winfield Scott Hancock, U.S.A. There is an artillery garrison, with quarters for 300 men.

FORTH BRIDGE, THE. A cantilever bridge erected over the Firth of Forth at Queensferry, Scotland, in 1883-90, famous on account of having the longest spans yet attempted. The two main spans are each 1710 feet long, and the total length of the bridge is 8295 feet. The towers are 343 feet in height. The bridge contains 51,000 tons of steel, and the whole cost of construction was about $13,000,000.

FORT HEN'RY AND FORT DON'ELSON. Two forts, twelve miles apart, in Tennessee, prominent in the early period of the Civil War; the first situated on the right bank of the Tennessee River, and the second on the left bank of the Cumberland River, both standing near the line between Tennessee and Kentucky. They were built and strongly manned by the Confederates in 1861, and were the two most important works in the first line of defense in the West. They were especially important in that they controlled the entrance to two avenues by which Tennessee and the States farther south might be entered. Early in 1862, General Grant, stationed at Cairo, asked and received permission to attempt their capture. On February 2d a flotilla of gunboats under Com. A. H. Foote, followed by land troops under Grant, left Cairo, and on the 4th arrived before Fort Henry, which was then defended by 3000 men under General Tilghman. A combined attack by land and water was planned for the 6th, but the fort was taken within an hour on that day by the naval forces alone, some time before the troops arrived. The unavoidable delay of the latter enabled most of the garrison to escape to Fort Donelson, though Tilghman and about 70 of his men surrendered with the fort. On the 12th Grant moved upon Fort Donelson with a force that ultimately numbered 27,000. The fort, having been considerably reënforced, had a garrison of between 18,000 and 21,000, including the commands of Generals Floyd, Pillow, and Buckner. On the 13th Grant began a cannonade, and on the 14th an attack was also made by the fleet; but within two hours every gunboat was disabled, 54 men were killed, and Foote was compelled to withdraw. The Confederates, hoping to open up a way for retreat toward Nashville, attempted a surprise on the morning of the 15th. They were at first successful and actually secured a line of retreat, but they failed to profit by it, and at 3 P.M. Grant, who had been absent during the early part of the engagement, for the purpose of conferring with Commodore Foote, then wounded aboard his flagship, ordered a general advance, drove the Confederates within their own lines, and gained a position within their works. About 2000 on each side were killed or wounded in the course of the day. Grant prepared for a general assault early the next morning; but the Confederate leaders, recognizing the futility of further resistance, decided to surrender. During the night, Floyd with about 1500 men, Forrest with five or six hundred, and Pillow with his staff, escaped, leaving the fort in command of Buckner. This officer had originally been ranked by both Floyd and Pillow, the former of whom, having his unsavory record as Secretary of War in mind, dreaded to surrender for 'personal reasons,' while the latter violently opposed the idea of surrendering at all. On the morning of the 16th Buckner sent a message to Grant proposing an armistice until noon and the appointment of commissioners to settle upon terms of capitulation. Grant returned on the instant the now famous reply: "No terms except an unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." Buckner had no alternative, and at once surrendered the fort with between 12,000 and 18,000 men, at least 40 guns, and a great quantity of ammunition. The terms of Grant's answer aroused the enthusiasm of the North, where, by a play upon the initial letters of his name, he soon came to be known as "Unconditional Surrender Grant." Consult: *Official Records,* vol. iv. (Washington, 1881); Grant, *Personal Memoirs* (New York, 1895); Johnson and Buel (editors), *Battles and Leaders of the Civil War,* vol. i. (New York, 1887); Force, *From Fort Henry to Corinth* (New York, 1881); and Swinton, *Decisive Battles of the War* (New York, 1867).

FORT HOLMES. See MACKINAW ISLAND.

FORT HOW'ARD. A United States military post, established in 1900, and occupying a reservation of 149 acres. The post-office and telegraph station is Baltimore. It is situated at North Point, Patapsco River, 9½ miles from Fort McHenry, and has a garrison of two companies of coast artillery.

FORTIFICATION (Lat. *fortificatio,* from *fortificare,* to fortify, from *fortis,* strong + *facere,* to make). That branch of military engineering which has to do with the design and construction of temporary and permanent defenses for the protection of military forces under fire. The subject may be divided into Field Fortification, which is properly a branch of Military Field Engineering, and Permanent Fortification, the latter being subdivided into Permanent Land Fortification and Seacoast Defense. This classification will be observed in the present treatment.

FIELD FORTIFICATION.

The chief aim of a commander of a military force operating in the field is to have his army not only in the best possible condition, but in the best position for conflict with the enemy. In spite of precautions, these conflicts may come about through accident, and an army forced to fight or in danger of attack must use every means at its command to strengthen or fortify a position which may or may not be of its commander's choosing. Often an unexpected collision of some portion of the force with the enemy may develop into a general battle. The army may be surprised in encampment. More frequently, the commanders of the opposing forces will be in a general way aware of the position and strength of the enemy. Each will know whether on the whole he prefers to give battle or to obstruct the progress of his opponent as much as possible without bringing on a general engagement except in positions affording his army natural advantages. (See RECONNOISSANCE.) The latter course will, in general, be the lot of the weaker. The stronger may also strive to occupy positions which the weaker must attack to protect his own supplies. The commander expecting to be attacked will select the best available position for his troops—one which the natural advantages of the ground will make it easier for him to hold and more difficult for his opponent to attack. A section of the line will be assigned to each corps or division of his army. The length of the section thus assigned will vary greatly under different circumstances. Ordinarily, not less than six men, including those in the firing line, supports, and reserves, should be allotted for each yard of the line. Each subdivision, on reaching the portion of the line assigned to it, proceeds as rapidly as possible to fortify—that is, to make stronger its line. If practicable, the position of the line will be indicated by the engineers; otherwise, it will be inspected as soon as possible with a view to strengthening it, wherever opportunity offers.

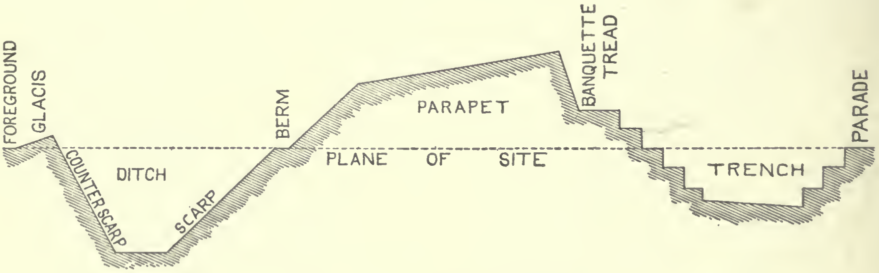


FIG. 4. PROFILE OF FORTIFICATION

In the Civil War, especially toward the latter part, the troops, as soon as they arrived on the line, began the construction of light trenches with their bayonets and cups. In several modern foreign armies the troops carry as a part of their equipment small intrenching spades or picks, with which a rifle-pit or lying-down trench (Fig. 1) is hastily constructed. If time allows, this is enlarged, first into a kneeling trench (Fig. 2), and then into a standing trench (Fig. 3). The protection furnished by such a trench is ample against infantry fire, as thirty inches of earth will stop or deflect a modern rifle-bullet. See TRENCH.

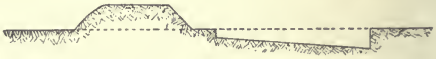


FIG. 1. CROSS-SECTION OF LYING-DOWN TRENCH.

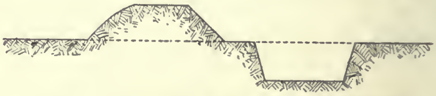


FIG. 2. CROSS-SECTION OF KNEELING TRENCH.

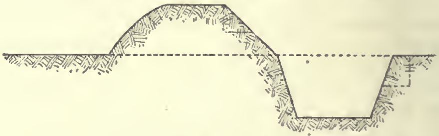


FIG. 3. CROSS-SECTION OF STANDING TRENCH.

The opposing commander, if determined on a frontal attack, will probably make it at the earliest possible moment, in order that the defenders may have the minimum of advantage of protection from their defenses. His command, too, will probably proceed similarly to strengthen certain portions of their own line, which must be held. If successful in capturing any portion of the enemy's line, he may turn their intrenchments in order to prevent recapture. To obviate this the defender, circumstances permitting, will so strengthen his trenches that the parapets shall be able to resist artillery fire.

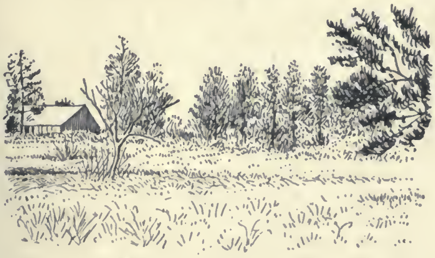


FIG. 5. SHELTER TRENCH—FRONT VIEW.

This requires a thickness in ordinary soil of nine feet or more. The nomenclature of the various portions of the profile is indicated on the accompanying cut (Fig. 4). If time allows, the interior crest of the parapet will be revetted with sod, fascines, hurdles, logs, sand-bags, gabions, or other available material. Provision will be made for draining the trenches, which will be constructed as inconspicuously as possible. The illustrations (Figs. 5 and 6) show a front and rear view of a shelter trench where precautions have been taken to hide it from view in front. The ground in front of the trenches within the most effective range of rifle fire should be cleared of everything which would hide an advancing enemy from view, or afford him cover. Obstacles designed to hold an advancing enemy as long as possible under sustained fire will be placed in front of the intrenchments. The principal modern obstacles are wire entanglements (Fig. 7) and abatis (q.v.). There are also trous-de-loup, or shallow military pits, chevaux-de-frise, crows'-feet, and other similar obstructions. If time allows, a portion of the ground will be mined with charges of explosives (see MINES AND MINING, MILITARY), arranged to fire automatically upon the passage of troops over them. In many cases the site for the defensive line can be so chosen that the land in front shall be marshy, or can be flooded by damming a small stream.

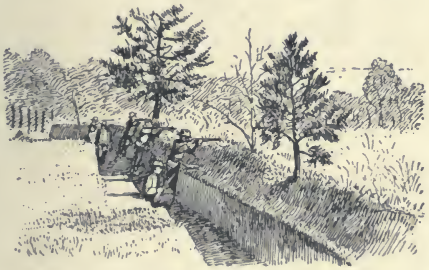


FIG. 6. SHELTER TRENCH—REAR VIEW.

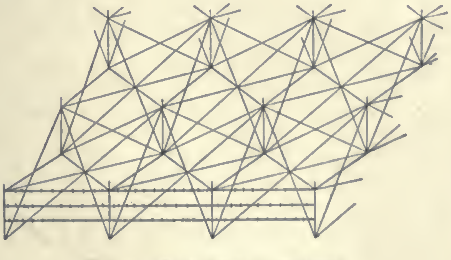


FIG. 7. WIRE ENTANGLEMENTS.

There are usually along the line points naturally much stronger than others. Special pains will be taken to secure and strongly fortify these points by the construction of redoubts, which are inclosed works, usually polygonal, square, or triangular in shape, provided with as many as possible of the structural advantages of regular fortification, and built on a scale commensurate with the strength and character of the force by which they are to be held. These are laid out on the ground in such a way as best to utilize the natural features in securing the maximum effectiveness of the redoubt at a minimum of labor of construction. As guides in making these constructions light frameworks of wood, indicating the proper cross-section, are made and placed in position at the angles of the work. In designing the cross-section for a redoubt or intrenchment, it should be borne in mind that unless the excavation and embankment are equal in amount, earth may have to be carried some distance. In constructing such work it is usually best to assign tasks to each man or squad. About six feet or two paces of crest should be apportioned to each man. After slight experience a man can, under stress, excavate about one cubic yard of ordinary earth in the first hour, provided the lift and throw are not excessive. The amount which he can be counted upon to do per hour diminishes considerably after the first few hours. Traverses (q.v.) should be built where necessary on the works to protect portions of the line which would otherwise be enfiladed by fire from a distance. As soon as possible bomb-proof shelters should be dug out or constructed, and also, if the works are to be held for many days, magazines for the ammunition. The weak points of a defensive line are the flanks. The opposing commander may therefore strive to capture the line by attacking it in flank, where he can bring a heavy fire to bear, and will have to meet only a small fire. It is therefore of great importance that the flanks should, if possible, rest on or near some natural obstacle, as a marsh or river, which will retard the movements of the enemy. If this cannot be done, special provision will have to be made for strengthening and holding them.

During the Mexican War and in recent European wars, villages on the line were frequently placed in a state of defense. This was practicable because of the general use of masonry buildings and walls. The artillery of the defense will be stationed in the intervals between redoubts behind epaulments, constructed by heaping earth in front of the guns, or in gun-pits formed partially by embankments and partially by excavation.

Provision must be made for a system of roads in rear of the line along which troops can be transferred from one portion of the line to the other, or by which supplies or reserves may be brought, or along which a defeated or demoralized portion of the army can retire to a position in the rear, where it may be re-formed. Bridges or other defiles in rear of the line which may serve as a line of retreat or supply should be well protected by blockhouses or bridgeheads at their ends, which will enable a small force to hold a large one in check while the army is passing.

The fortifications just described are generally known as hasty intrenchments. Where they are more carefully constructed or improved, they become known as deliberate, or semi-permanent, fortifications. The latter term is more particularly applied to the fortifications constructed around an important city which it is thought may become an object of attack on the part of an enemy, and which it is desired to hold at all hazards. They correspond to the permanent fortification applied in Europe to cities of similar importance, the main difference lying in the fact that the works are maintained in time of peace in the permanent system, while semi-permanent works are allowed to fall into disuse upon the cessation of hostilities. These fortifications will be found discussed later in this article, under Permanent Land Fortification.

The main principle upon which field fortifications are based is the fact that men protected by them present but a small target to the fire of the enemy, whereas troops not so protected are exposed. This becomes of great importance at the ranges at which modern battles are fought. If held by a determined force they greatly increase the possibilities of the defense; and should the attacking force be defeated or become at all demoralized, would constitute a base from which the defenders could make a counter-attack. They were largely used in the Franco-Prussian, Russo-Turkish, Cuban, Philippine, and South African wars, many instances occurring where a force with their assistance has held in check one many times larger than itself. The general subject of field fortifications has been carefully treated in Fiebeger, *Text Book on Field Fortifications* (New York, 1901).

PERMANENT FORTIFICATION.

Permanent defense or fortification is the art of strengthening in time of peace a position which it is feared may become the objective of an enemy in time of war. Many of its principles are the same as those upon which field fortification is based. The essential differences result from the fact that the latter depend on the movements of an army and are constructed as their necessity becomes apparent, whereas in the former an attempt is made to foresee and to fortify the objective in time of peace. Such fortifications are constructed in advance because it is not believed that a defense commensurate with the importance of the interests at stake can be extemporized in time of war. The same care is used in the design and construction as in such permanent works of civil engineering as bridges, railroads, and tunnels. Especially must they be adapted to the probable form of attack and to the probable garrison available for serving them. As the result of improvements in material and in methods of attack, permanent fortifications eventually become obsolete in certain respects unless ameliorated to keep pace with these improvements. The essential principle to be kept in view is that the works should be ready to meet the attack when it comes.

A country having no coast-line is, of course, subject only to attacks by land. One having a large seacoast rival and no military powers on its land frontiers is concerned primarily with seacoast defense. The two fundamentally different methods of attack give rise to two general subdivisions of the subject, namely, Land Fortification and Seacoast Defense. Most countries subject to both forms of attack require both methods of defense.

PERMANENT LAND FORTIFICATION.

Historical Development. The art of fortification and the methods of attack which the fortifications have been constructed to resist or to supplement have developed together. Each improvement in one has found its counterpart in the other. In different countries the development has not always proceeded in exactly the same way. The constructions have been modified in accordance with the characteristics of the people and with the topographic features of the country. Probably the first attempt at defense consisted in the erection of fences or palisades of wood, intended to serve as physical obstructions to the advance of the attacking force. These appear in various shapes, sometimes being made of stakes driven in the ground and connected by wattling, sometimes by weaving together the branches of the natural growth of the woods, the entrance to the place being by tortuous and concealed routes. These wooden obstructions, which were subject to attack by fire and by battering and cutting tools, were sometimes further fortified by the addition of a second, and even a third, row of stakes. Later, the space between these two lines was filled with earth. (See Stockade.) The next general step was the substitution of masonry for wood. These improvements were met by the attack with provisions for escalade. The walls were then increased in height, and escalade became extremely difficult. Battering implements were developed for the purpose of making breaches in the bottom of the wall. These were met by placing earth in rear of the wall, bringing it up to within a few feet of the top, and furnishing a space for the movements of men at the top who could, by throwing missiles from above, interfere with the ordinary operations of the besieger at the bottom of the wall.

As the besieger became more pertinacious, this fire from above became of more importance, provision being made for extending platforms out, thus furnishing better positions from which missiles could be thrown down the face of the wall. To still further facilitate the defense from above, towers were constructed at intervals, from which it was easy to hurl missiles along the face of the wall. These towers were sometimes made so that they could be isolated from the main portion of the wall and would not necessarily succumb to an enemy who had succeeded in reaching the top of the wall. The besieger, to cope with these means of defense, utilized covered timber passages to protect himself from the missiles from above. In this way he was enabled to reach and attack the wall with battering and other implements. As these alone became insufficient to overcome the increased resistance of the walls of defense, the besieger constructed high wooden towers from which he, in his turn, could hurl projectiles at the defenders on the walls. These towers were attacked by the defender with fire. To prevent them from being burned, the besieger covered them with rawhide. He also made use, either alone or in connection with these towers, of high banks of earth, which were gradually worked forward and higher. To meet these methods and render them more difficult of success, the defense surrounded the walls with large ditches, making provision where practicable for filling them with water at will.

The development of the various forms of bows and of catapults and other machines for throwing stones, etc., rendered the conflicts more severe and widened the area of contact between the defender and besieger. (See ARTILLERY.) Many of the walls constructed were most formidable in their proportions. They included sometimes entire cities. In other cases they were introduced as barriers to the approach of a large section of country, the greatest in length being the Great Wall of China. In Germany development occurred along somewhat different lines. More intricate protection was made in many places. Houses were developed into castles, which were placed in naturally inaccessible positions. They were gradually strengthened by many ingenious devices. The house was surrounded by a ditch, the only method of crossing which was by a drawbridge raised and lowered at pleasure from the castle. Devices such as machicoulis, loopholes, and embrasures, were provided along the outer wall, from which the defender could attack the assailant while being himself fairly well covered. The passage from the drawbridge to the interior could be barred by a portcullis, which was flanked by loopholed rooms. The interior of the castle was provided with a high tower or keep, capable of defense after the outer walls had fallen.

The foregoing represents, in general terms, the state of the art of fortification at the time of the invention of gunpowder. The general use of the latter caused many changes in the system of fortification, which gave rise, during the nineteenth century, to the development and modification of what is known as the bastion system of defense. This system has exercised such a powerful influence on the development of fortification that a brief account of its history will be of interest. The underlying principles of all fortification are unchangeable; but their application must, of necessity, be affected by every new invention of warfare, mechanical or strategical. Consequently, while the bastion system, as a system, is practically obsolete, its basic features still remain, although in a modified form, and on a correspondingly larger scale.

Much of the nomenclature of the art also had its origin in this system, although many of the terms are now applied to parts of forts, which, in their present form, do not indicate the derivation of the word as originally applied. Reference has been made to the placing of towers at intervals along walls for the purpose of flanking the latter. These towers were either circular in plan, or square, and were known as roundels. The portion of the wall connecting them was called the curtain. The introduction of artillery caused increased thickness and decreased height to be given to the walls, and the roundels were enlarged to permit the introduction of the large guns. With artillery the besieged possessed an advantage in that they could reach the besieger at a greater distance, and could destroy the various material objects the latter had heretofore used in approaching the walls. The besiegers were obliged to discontinue their wooden constructions and substitute trenches of earth to protect them in their advances. They also constructed breaching batteries at a distance off from the walls for the purpose of playing on the latter, breaking them down and making breaches through which an entrance could be made to the fort. The approach was generally made toward a tower, by zigzag trenches, but pointing, so far as possible, in such a direction as not to be subject to enfilade fire from any other part of the fort. It was observed that in the use of the roundels there were small areas called angles of dead space in front of the towers which could not be well covered by the fire from the tower itself. This led to an alteration of the plan to that of a pentagon, known as a bastion. One side of the pentagon was placed along the line of the wall. The angle farthest from the wall is known as the salient, the two sides adjacent to it as faces, the two sides connecting the faces with the wall as flanks.

This combination of a number of bastions connected with each other by curtains, the whole forming an enceinte, is the basis of the bastion system. The bastions were sometimes filled with earth to the grade where the guns were placed. The top surface of this filling was known as the terreplein. The length and direction of the faces, flanks, and curtain were such as to enable the ground in front of each portion to be flanked by the fire from some other part of the work. In front of the terreplein there was placed a wall originally breast-high, and therefore designated as the parapet. Ramps were inclined planes leading from the terreplein to the main level of the ground in rear, known as the parade. The general mass of the enceinte was sometimes called the rampart, and was of such a height as to afford the required protection to the materials and people in rear. On the outer side of the enceinte was the ditch. The front wall of the enceinte was the scarp. It was found that with this exposed to view the ditch could be reduced by the fire of artillery at a distance. The outer portion, i.e. the counterscarp, therefore, was raised to such a relative height that the masonry of the scarp could not be breached except by batteries coming to the crest of the counterscarp. The ground in front of the counterscarp is the glacis. A depressed road, known as the covered way, running around the work on the counterscarp, was added. As the weak points of the system were developed by attacks, efforts were made to strengthen them. A crescent-shaped work known as the demilune was placed in front of the curtain, and the ditch and covered way were extended around in front of it. To permit its faces better to be flanked, it was given the shape of a redan, and is now generally spoken of as the ravelin. The redan (q.v.) in its simplest form is constructed of two parapets of earth, built so as to form a salient angle, having the apex pointing in the direction of the enemy. It enabled the defense with its fire to enfilade and sometimes to take in reverse batteries which the besieger had succeeded in erecting on the counterscarp for the purpose of taking the adjacent bastions. It left, however, the curtain scarp exposed to distant fire. As a defense to this, a detached work, or tenaille, was constructed in the ditch in front of the curtain. The gates of the work were usually placed in the middle of the curtain, openings being made through the tenaille for the defenders to reach and return from the ravelin. The passageway through the ditch in front of the tenaille was sometimes protected with a small earthwork on either side. As the height of the parapet above the terreplein gradually increased, becoming a breast-height wall in name only, there was added immediately in rear a small earthen platform known as a banquette, on which the infantry troops could stand in delivering their fire. As a result of the increased power of guns, the length of each front increased. As the fire became more accurate, greater attention was paid to bringing a cross-fire on every portion of the work outside of the enceinte. The bastions were enlarged at the expense of the curtains. Provision was made for works inside the fort, which could be held after the fall of the bastion itself. Those erected in the bastion proper were known as cavaliers. The function of the covered way was enlarged. The covered way itself was increased in size both at its salient and reëntrance, the enlargements being known respectively as salient and reëntrant places of arms. These served as rallying-points for large numbers of defenders, who rushed out in sorties at times when it was thought a counter-attack would most embarrass the besieger.

Palisades and other obstacles were introduced on the glacis. It was seen that as the fronts were made smaller and increased in number, the general outline of the work approached more nearly to a circle, the adjacent fronts came nearer to being on the same straight line, and capable of supporting each other better in resisting attacks. More attention was given to the use of the most effective angles in the bastion, and corresponding protection of the faces and flanks. Casemates were constructed in the flanks of the bastions for the better flanking of the ditches. To render it more difficult to enfilade the covered way, its crest was made *en crémaillère*. Short traverses were in some cases added. Redoubts were added in the ravelin. The accompanying illustration indicates a typical arrangement of the bastion system toward the end of the eighteenth century. (See Plate of FORTIFICATION, Figs. 1, 1a, and 1b.) The bastion system was used for many years, both for large and small works. In some instances the wall around a whole city, such as that of Paris, consisted of a great number of bastion fronts, while in other cases many small forts, containing all the essentials for their own defense, were constructed. An example of the latter is shown in the illustration of Fort Issy, one of the outer defenses of Paris.

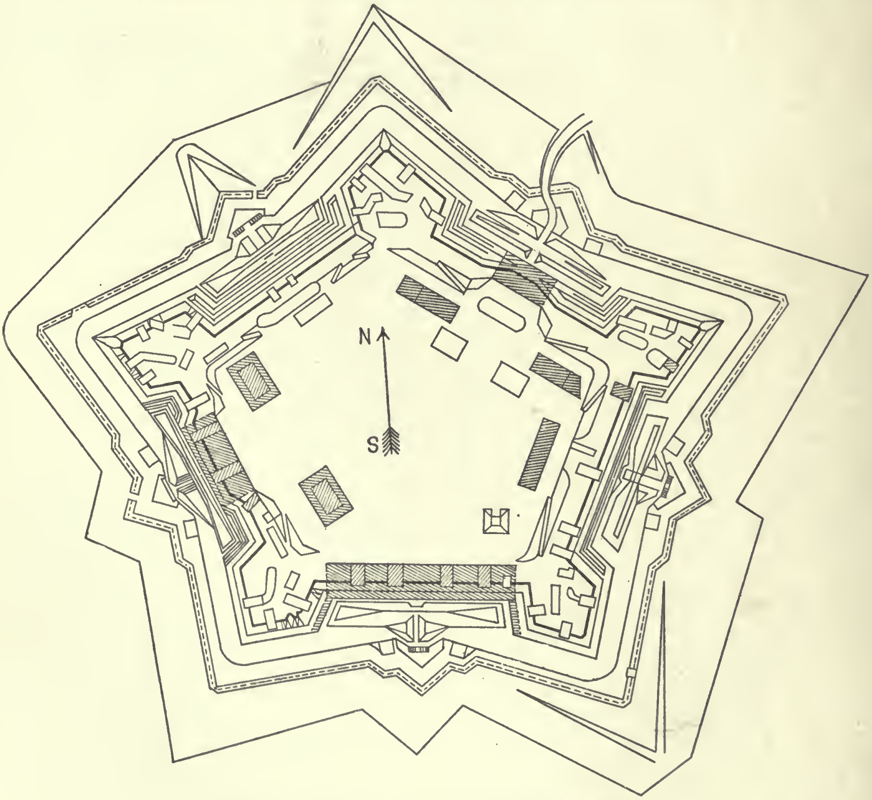


FIG. 8. FORT ISSY—A DETACHED BASTIONED FORT.

It is not practicable in an article of this length to cite the names of the various engineers who were prominent in the development of the features of the system. It would, however, be incomplete without the names of a few of the more celebrated. Albert Durer, the famous painter, is credited with great improvement in the development of roundels. It is not known who first suggested the change to bastions. Daniel Speckles, an engineer in Strassburg in the sixteenth century, devoted much thought to the development of the system and enunciated many principles, the force of which was not fully recognized until a century or more after his death. The system first became largely developed practically in Italy, and then throughout Europe, as a result of the fact that many Italian engineers were employed to develop the system of defenses in other countries. As the system was adopted elsewhere, characteristic national changes were made in it. In Spain the covered way, which is very essential where an active defense is desired, was little used, and sometimes omitted. Provisions for delaying the besieger by more gradual retirement were increased, while those for actively attacking him were diminished.

In Holland the nature of the country led to the use of wide wet ditches. The lack of earth resulted in the use of lower parapets, the main one being sometimes supplemented by a lower one in front for the purpose of covering with its fire the wet ditch. The works were frequently increased in number and made of more complicated plan, rendering an attack more difficult by an assailant unfamiliar with the ground. One of Holland's most distinguished military engineers was Baron Coehorn (q.v.). In France the art of fortification by the bastion system was reduced to precise rules. The first French author of prominence was Bar-le-Duc, who lived in the latter part of the sixteenth century. Marshal Vauban (q.v.), more generally known than any other engineer in any country as an exponent of the system, was a constructing engineer, and a general, rather than a writer. He is said to have actually besieged over 50 forts, built 35 new ones, and improved some 300 old ones. He also developed the use of ricochet fire and of parallels connecting at intervals the approaches for the attack of forts. The approaches afforded additional opportunities for the establishment of breeching batteries. Later came General Curmontaigne, who brought the bastion system to its most highly developed state.

Soon afterwards ideas made their appearance which have since resulted in the development of simpler but stronger fortifications. Montalembert in France recognized the defects of the bastion system, and took the position that a siege had become primarily an artillery contest. He proposed a large use of casemates, which should protect the guns from covered fire. Instead of relying upon bastions in the salients for a flanking fire, he advocated the placing of low caponieres extending from the middle of each front into the ditch. His ideas did not meet with favor in his own country for many years, but were utilized and developed in Germany into what became known as the *polygonal system* of defense. In Sweden the habits and experience of the country led to the development of land fortifications similar to those of ships. The Swedes placed their guns in casemated batteries in two or more tiers for their land fortifications, as well as for coast defense. In Germany the bastion system had never met with great favor. It is here that we find the first extensive use of the polygonal system. The latter differs from the bastion system in the omission of the bastions and the elongation of the main faces to the angles. It has advantages of saving the labor and ingenuity sometimes required to find suitable locations for the various sides of the bastions. The main faces of the fort adapt themselves more readily to the site. A ditch is provided in front of the enceinte, and a caponiere—that is, a casemated work—is pushed out from the middle of each face into the ditch, having a good flanking fire on the latter. It. in its turn, is protected from a distant fire by its relative lowness as compared with the covered way, or with a ravelin or other outwork placed in front of it. The system was used both for the construction of individual forts and of large enceintes surrounding great cities. Perhaps the most advanced example of its use in the enceinte of a large city is in the one constructed on the north, east, and south sides of Antwerp, Belgium. After the bastion and polygonal systems, what is known as the tenaille system was considered as the next most important type of construction. It consisted of a succession of redans joined to each other, giving an alternation of salient and reëntrant angles. The main idea was that each face should flank the ground in front of the adjacent one. While stoutly advocated on theoretic grounds, the system was never largely applied in practice.

The many years of war at the beginning of the nineteenth century in Europe furnished a practical test of the fortification systems as they were in existence, and emphasized their defects. It was found that the inclosed enceintes were not large enough to hold a sufficient number of troops and supplies. They were too close to the cities to protect the latter from bombardment as the range of the guns increased. They exercised little influence outside of the reach of their own guns, as they did not contain room enough for a garrison larger than needed for their own service. It was found that unless a number of them surrounded the objective, the large armies simply ignored them by passing out of range of their guns.

The scope of the fortification was, therefore, enlarged by building, in advance of the main enceinte, small forts containing all the elements of defense. A line of these forts inclosed the ground necessary for the encampment of a large army. The new system was known as that of intrenched camps. As greater use was made of curved fire. it became desirable to expose less and less masonry in the scarp walls of the individual forts. In the development of the system of intrenched camps the different countries used different designs for the small forts. As the range of the artillery guns increased, it became evident that the fate of the siege depended less and less on the small. carefully arranged niceties which had been of such value in earlier days. The outer works became simpler and stronger. As the range of the artillery was increased still further by the introduction of longer and more accurate guns. and of shells containing explosives. additional bombproof cover in which the defending troops could remain when off duty became more important. It was becoming possible for the defender to compel the attacker to use his batteries at a range nearer to that of ordinary vision. It was found that the high forts and traverses furnished him with an excellent target. and this led to the introduction of attempts to render the forts more nearly invisible. They were made lower, and their outer appearance harmonized more closely with the general surface of the ground. The fire of the guns was then found to attract the artillery fire of the attacker. The guns were taken out of the forts or redoubts and placed in batteries in the intervals between the forts, every attempt being made to conceal their actual position from the attacker.

The defense of Sebastopol in 1854 and 1855, the Civil War in the United States, and the Russo-Turkish War in 1877-78, showed the great value of works adapted to the site, simply and strongly built, with a view to meeting the latest phases of the attack. The more recent introduction of smokeless powder still further emphasized the advantage of invisibility in the works. The redoubts have now become essentially a place for the development of infantry fire supplemented by machine guns, and in some cases small rapid-fire guns. The use of the interior enceinte is becoming less general as the outer line of batteries becomes stronger.

It is apparent that the art of fortification developed slowly but gradually and progressively, for many centuries, but it has been within the last century and a half that radical changes have taken place. New conditions are constantly arising, and it is impracticable to indicate what the art will be in another century. An interesting account of the development of the old-type fortifications is given in Viollet-le-Duc, *Histoire d'une forteresse* (Paris, 1873). A full account of the historical development of the various systems of fortification will be found in *Woolwich Text-Book of Fortification*, part ii. (London, 1893).

Modern Permanent Land Fortification. The modern system of permanent land fortification consists of the use of forts d'arret and of intrenched camps. The former are individual forts, complete in themselves, for small or medium-sized garrisons, and are placed for the protection of defiles, such as mountain passes, and of the frontier. (See Frontier, Military.) The intrenched camp, which has taken the place of the old continuous enceinte as a fortification for cities and positions which it is desired to fortify in advance, consists primarily of an outer line of forts and batteries. The distance of this line from the city to be defended varies greatly in different places. Six thousand yards may be taken as a typical distance with modern artillery. The main conditions to be fulfilled in determining the distance are—that the works shall be so far to the front that the city cannot be bombarded from any position outside of them without coming under their fire; and that they shall be far enough out to provide sufficient room in their interior for the movements of the army to occupy the place. The accidents of the ground generally control their exact position. A work will be withdrawn or pushed out considerably, as the case may be, for the sake of securing a commanding position. The forts are now arranged essentially for a defense of infantry and machine-gun fire. They are placed at such distance apart along the circle as to enable them to be mutually supporting. Twenty-five hundred yards may be taken as a typical distance. Batteries for guns and howitzers are established in suitable positions in the intervals between the forts. The guns used rarely exceed seven inches in calibre; howitzers of the same or slightly larger calibre are used. The batteries must be so placed that the guns can bear directly on assaulting troops.

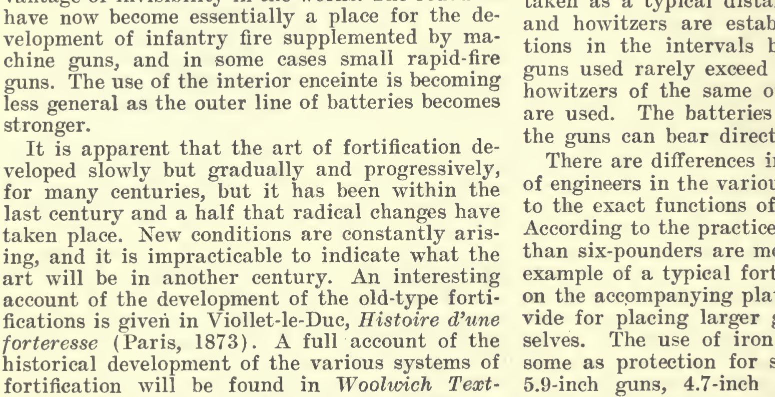
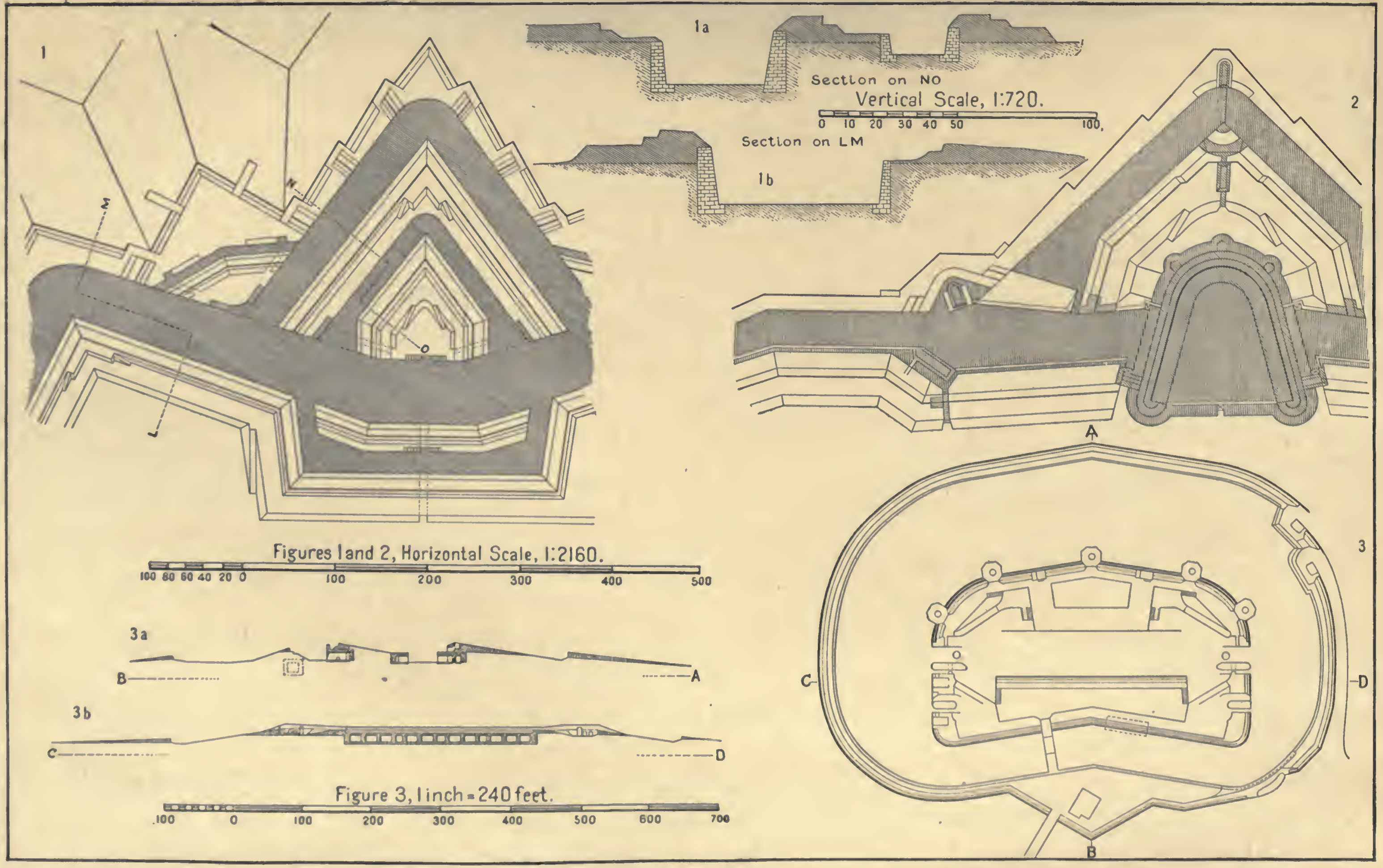


Fig. 9. modern battery.
1 and 3, ammunition and stores; 4 and 5, guns; 2, shelter casemate.

There are differences in the practice and views of engineers in the various European countries as to the exact functions of the forts and batteries. According to the practice of some, no guns larger than six-pounders are mounted in the forts. An example of a typical fort on these lines is shown on the accompanying plate (Fig. 3). Others provide for placing larger guns in the forts themselves. The use of iron armor is advocated by some as protection for such guns. Cupolas for 5.9-inch guns, 4.7-inch guns, and for 8.2-inch rifled mortars were established in the triangular forts built for the defenses of Bucharest. It seems to be acknowledged generally that it is no longer desirable to maintain large guns behind ordinary parapets in the forts. It has not yet been settled, by war experience, whether it is better to keep them in the fort in cupolas, or to take them out, placing them in detached batteries; probably the consensus of opinion is in favor of the latter method. The former certainly has the disadvantage that the besieger in attacking a fort attacks both the infantry and artillery of the defense. In general, the individual forts are designed for a garrison of about one battalion of infantry, an example of a typical battery being shown herewith.

It is intended to construct an infantry parapet in time of war across the intervals between the forts and batteries, sometimes running in front of them. Openings must of course be provided in this line to permit the egress of the troops making sorties. Arrangements are made for clearing the ground for some distance in front of the forts and batteries, and for the necessary accessories of the defense including such artificial means as towers or balloons, to assist in ob-

FORTIFICATION



serving the enemy's movements; search-lights with which to illuminate his works at night; and for the running of telegraph lines, roads, and railroads. In many cases it is the practice instead of doing all these things in advance, to have projects prepared which include the most up-to-date plans for them. France, Germany, Russia, Austria, all have cities fortified on the above general lines. In many cases, however, the cities were first fortified earlier, and the present fortifications are modifications of the old ones, conforming as near as may be to the modern ideas. Most of the cities, in addition to being defended on the lines indicated, are provided with an interior enceinte, which is an additional security against surprise by any operation of the enemy's troops which may succeed in forcing the outer line. Many engineers are of opinion that an interior enceinte is no longer necessary; that if anything be placed inside it should be simply in the nature of a palisade or similar work, to prevent surprise. Still, the fact remains that most of the cities fortified as intrenched camps have also the enceinte.

PROVISIONAL FORTIFICATION.

Provisional fortification is the same in its function as permanent fortification. It is sometimes known as semi-permanent fortification, sometimes as deliberate fortification. It is used either to complete a system of permanent works which are not complete when war breaks out, or to defend a totally new position that might have been provided with permanent works had it been known definitely that an attack was to be made. Probably the most notable and extensive use of provisional fortification was in the defenses of Washington during the Civil War. The interior cities of the United States are not defended by permanent land works. It is generally believed that they are not required for coping with any foreign foe likely to attack the United States. During the Civil War, however, when the country divided into two parts, the two capitals being so close together as Washington and Richmond were, it became of the utmost importance that Washington should be provided with strong fortifications. In general, the forts were placed at intervals of about 1000 yards, and every prominent point was occupied by inclosed works, every important approach or depression of ground seen from the forts swept by field guns, and the whole connected by infantry trenches. The works were gradually constructed as the war went on; were carefully executed, provided with timber magazines for the ammunition, and with the necessary traverses, bomb-proof shelters, and other essential features. The success of the semi-permanent works of the Civil War, those used by the Turks at Plevna, and of some other works constructed only shortly before hostilities, has caused much attention to be paid to the value of this class of works.

Blockhouses. In some countries, as, for example, in the case of the Spanish in Cuba during the last insurrection, many towns were surrounded by blockhouses placed in commanding positions and within short distances of each other immediately outside the cities and towns. They were also used in connection with the construction of the famous Trocha, and in the vicinity of many sugar-mills and other valuable properties. Much ingenuity was displayed in the construction of these houses, the system being developed probably more fully than ever before. They were sometimes frame structures, sometimes masonry, sometimes of boiler iron, and consisted of either one or two stories. Blockhouses are well adapted for use where the enemy from whom the attack is expected is not provided with artillery of sufficient power to demolish them. They were largely used by the British in South Africa.

Bibliography. For fuller details on the subject of permanent land fortifications, the reader should consult Mahan, *Permanent Fortifications*, revised by Mercur (New York, 1887); Woolwich, *Text-Book of Fortification and Military Engineering*, part ii. (London, 1893); and Lewis, *Permanent Fortification for English Engineers* (Chatham, 1890).

COAST DEFENSE.

Coast defense, in its broadest sense, implies the defense of the coast against hostile attack. This may be made against fortified places by a hostile naval fleet, alone or in conjunction with a landing force; or, a landing may be attempted in an out-of-the-way place by a large army brought in transports convoyed by naval vessels. The latter will probably not be attempted unless the fleet protecting the transports is stronger than any fleet by which it will probably be attacked. Such an attack must be resisted by a stronger army on shore, and becomes, therefore, largely a problem in land warfare. Coast defense, which is discussed fully from the strategic and tactical point of view in another article (see Coast Defense), as it is generally understood, has to do only with the resistance of attacks made by fleets. It generally resolves itself into an attack upon a harbor. This may be made for the purpose of securing control of the harbor as a base of operation and supply for the hostile fleet, or for the purpose of forbidding its use by the force of the country attacked; it may be to secure possession of naval docks, yards, and arsenals in the harbor, to prey upon commercial vessels, or to attack an inferior naval fleet which has taken refuge therein. The problem varies greatly, depending upon the population of the country, the occupations of its people, its resources, and the extent of its coast-line. France and Germany in the War of 1870-71 closed their ports for their own traffic as well as that of other countries, and carried on their war entirely on land, neither being in a position to attack the other by sea. England, being largely dependent upon other countries for her food-supply, is therefore bound, for the preservation of her existence, to protect her commerce on the seas. This policy imposes upon her the maintenance of an enormous navy, which was held for many years to be a sufficient protection against any attack that might be made on her shores. She has also, however, adopted the policy of fortifying her principal harbors. The problem for the United States is at the other extreme. She has an enormous coast-line and a relatively small navy. It has always been her policy to fortify her principal harbors, seacoast cities, railroad terminals, and navy yards, and to leave her navy as free as possible for offensive operation. Guns afloat have an offensive advantage over guns ashore because of their mobility; but for defensive purposes the guns on shore have corresponding advantages over those afloat. They are mounted much more economically, gun for gun, can be fired farther and more accurately, and cannot be tricked away from the place they are intended to defend. Under modern methods of mounting, they present an extremely small exposure to the enemy, whereas the entire ship of the enemy becomes their target.

Historical Development. At the outbreak of the Revolutionary War few ports in the United States had been provided with fortifications; such as had been built were small and weak earth forts. Throughout the early years of the war England's ships were comparatively free to come and go as they pleased, a notable exception being the instance of the repulse of the British fleet by a small fort on Sullivan's Island, Charleston Harbor. Between the Revolutionary War and the War of 1812 some attention was given to the necessity for fortifying the coast, and a few defensive works were built. The best known of these to-day are Fort Columbus (q.v.) and Castle William, on Governor's Island, New York Harbor, which have endured to the present date, although now of little defensive value. During the War of 1812 the English blockaded New York and Boston, but were not able to occupy them; but the damage and demoralization caused by their depredations in Long Island Sound and Chesapeake Bay, to which was added the damage wrought on the city of Washington, produced a deep impression on the public mind as to the necessity for a regular system of fortification. Shortly after this war the general subject was carefully studied by the Board of Engineers of the Army, and work continued to be carried on under the comprehensive system which they inaugurated until the time of the Civil War. Many of the principles which they formulated are still applicable, the general principles underlying their plans, as stated, being as follows:

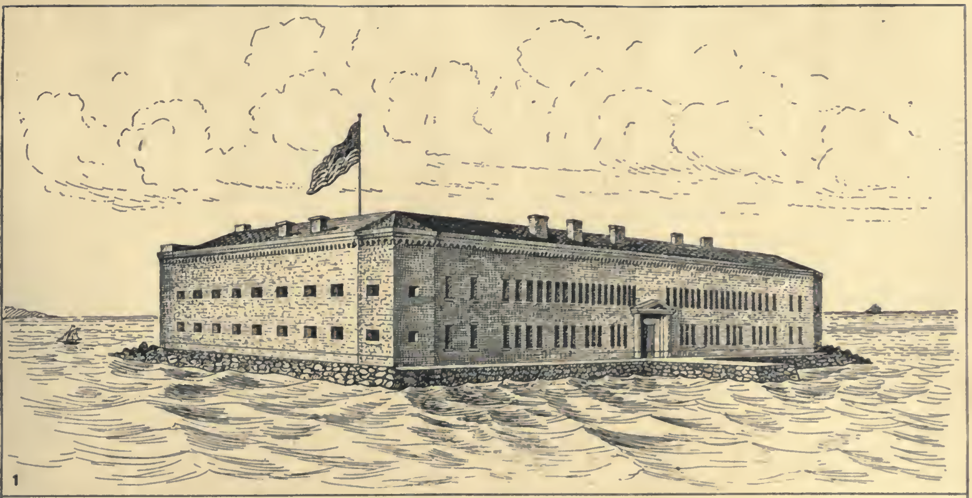
"The means of defense for the seaboard of the United States, constituting a system, may be classed as follows: First, a navy; second, fortifications; third, interior communications by land and water; and fourth, a regular army and well-organized militia. Fortifications must close all important harbors against an enemy, and secure them to our military and commercial marine; second, must deprive an enemy of all strong positions where, protected by naval superiority, he might fix permanent quarters in our territory, maintain himself during the war, and keep the whole frontier in perpetual alarm; third, must cover the great cities from attack; fourth, must prevent as far as practicable the great avenues of interior navigation from being blockaded at their entrances to the ocean; fifth, must cover the coastwise and interior navigation by closing the harbors and the several inlets from the sea which intersect the lines of communication, and thereby further aid the navy in protecting the navigation of the country; and sixth, must protect the great naval establishments."

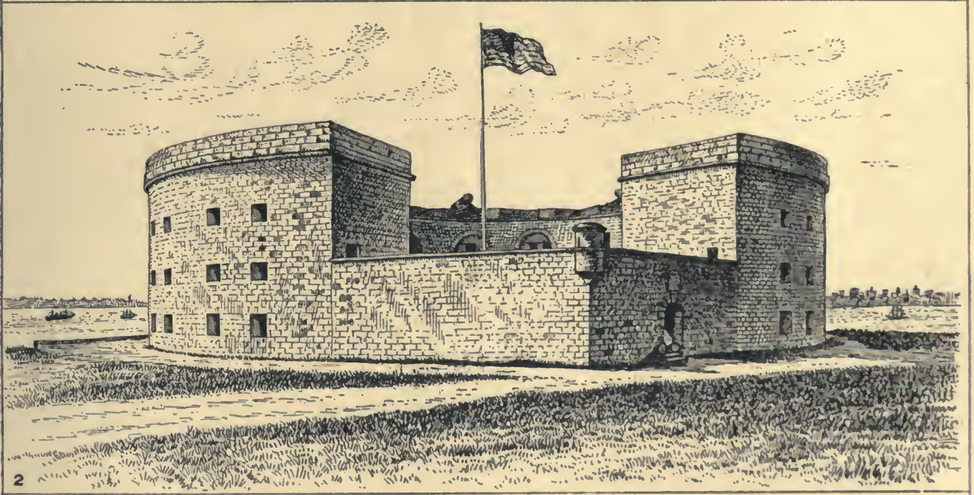
Reference has been made to Montalembert and his influence upon the art of fortification in Europe. He had attracted particular attention to the utility of casemates, which, as stated, were from that time forward freely used for many years in the flank defense of land fortifications. They were also deemed particularly applicable to seacoast works, and were used for this purpose in France, England, and Sweden. The first prominent example of their use in this country was in old Castle William, which stands as a type of the masonry seacoast fortress of the early part of the nineteenth century. Where used for land fortification, the condition had been imposed that the masonry should not be exposed to the fire of guns, as its destruction was considered to be only a matter of time. The conditions covering the naval attacks of the period in question were, in certain respects, different. The ships were of wood and carried a large number of guns. The general idea of fighting consisted in bringing as many guns as were needed on land into a comparatively small space where the channels were narrow. The attack, instead of being a matter of weeks, as in land fortifications, was expected to be a matter of hours. The wooden sides of the ships were particularly vulnerable, and it was believed that by putting the shore guns behind walls of stone they would be in position to fire much longer than those on ships. The casemate especially lent itself to this style of defense, in that by using it the guns could be placed tier on tier, and even at narrow and restricted sites many guns could be emplaced.

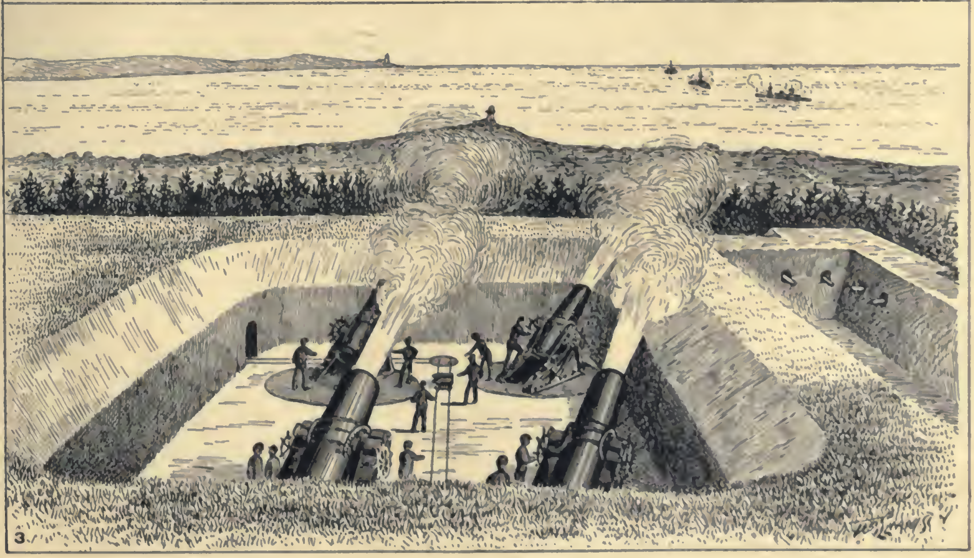
The guns were usually mounted one to each casemate. The scarp wall in front was given a thickness designed to resist the projectiles then in use on ships during the probable time of an engagement. In the latter works this thickness was about eight feet. The walls were thoroughly braced by the sides and tops of the casemates. Much study and attention was given to details, gradual improvements being made permitting a reduction in the size of the embrasures through which the guns were fired, and an increase in their angle of fire. The guns were arranged in the more recent works for a transverse of 30° each way, making a total of 60°. This fact led to the construction of works in the shape of a hexagon. Guns on adjacent faces were enabled to fire parallel to each other when traversed to their extreme position, thus preventing the existence of a dead angle along the capital of the salients. Some of the works were of brick; others of stone. Most of them were provided with a land defense of some nature to assist the garrison in resisting an attack by a landing party. Many of the works are well known, such as Fort Warren in Boston Harbor; Fort Wadsworth, New York Harbor; Fort Sumter, Charleston; and Fort Monroe, Hampton Roads.

About the time of the Civil War, however, there came radical changes in naval ordnance and attack. Rifled guns were introduced and ships were covered with iron. (See Guns, Naval.) The wonderful effect of rifled-gun fire on masonry was shown in the breaching of Fort Pulaski during the Civil War by the breaching batteries established on land by the Federals under General Gillmore. As the war progressed, the Confederate engineers found it desirable to occupy some positions on the seacoast not already fortified. This was done with provisional works of sand and timber. The magnificent resistance made by a work of this character, Fort Fisher, near the mouth of the Cape Fear River, assisted in attracting attention to the value of sand as a defense. Steam had by this time been generally introduced into navies, affording ships more latitude in taking up positions.

FORTIFICATION







1. FORT SUMTER IN 1861. 2. CASTLE WILLIAM, GOVERNOR'S ISLAND. NEW YORK.
3. A MODERN UNITED STATES MORTAR BATTERY.

These changes led to the introduction of armor in many cases for the protection of forts in Europe, it being argued that if good for the protection of ships' guns, it was good for the protection of forts, and that the latter could use as much of it as needed, whereas the ships were limited by the weight they could carry. In the United States the value of sand as a protection was appreciated. Immediately after the Civil War earthen batteries were built at important positions for mounting some of the smooth-bore guns then available. About 1875, appropriations ceased, and little work except of repair nature was done on the fortifications of the United States until 1890. By this time the rapid strides which had been made along the lines already indicated—that is, the introduction of steam into navies, the addition of improved varieties of armor, and the increase in accuracy and power of rifled guns—rendered the system of fortifications already built practically obsolete, except for certain minor purposes.

Modern Development of Coast Defenses in the United States. The War Department having invited the attention of Congress to the condition of the national defenses, and to the necessity for doing something to place them in better condition, the matter was taken up, and an act was passed in 1885 providing for the appointment of a board to examine and report at what ports fortifications or other defenses were most urgently required, the character and kind of defenses best adapted for each, with reference to armament and the utilization of torpedoes, mines, or other defensive appliances. The board, since known as the Endicott Board, consisted of the Secretary of War, the Chief of Ordnance, and Chief of Engineers of the Army, one other officer from each of these corps, two naval officers, and two prominent civilians. Their report, which was submitted the following year, forms the basis of the present system of fortifications in the United States. As a result of their study they recommended that defenses should be provided for the following ports, which were arranged in the order of their relative urgency: New York; San Francisco; Boston; the Lake Ports; Hampton Roads; New Orleans; Philadelphia; Washington; Baltimore; Portland, Maine; Rhode Island ports in Narragansett Bay; Key West; Charleston, S. C.; Mobile; New London; Savannah; Galveston; Portland, Oregon; Pensacola, Fla.; Wilmington, N. C.; San Diego, Cal.; Portsmouth, N. H.; Cumberland Sound; Kennebec River, Maine; New Bedford, Mass.; Penobscot River, Me.; and New Haven, Conn.

The defenses as to character and kind, with reference to armament, should be fixed and floating, one or both, according to locality, and armed with powerful cannon needed to repel attack from the most formidable ships. The shore batteries were to be armored turrets, revolving or fixed, armored casemates and emplacements in barbette. Earthen parapets and traverses, sometimes arranged with core of concrete or rubble masonry to add resistance to shock, were to be used for barbette batteries.

The Civil War had developed the value of the submarine mine as an element of defense. The Endicott Board laid stress on this element as follows: "It is not generally considered possible to bar the progress of an armored fleet by the mere fire of the battery; some obstruction sufficient to arrest the ships within effective range of the guns is necessary. The kind of obstruction now relied upon is the torpedo in the form of a submarine mine, and, except in special cases, exploded by electric currents, which are so managed that the operator on shore can either ignite the mine under the ship's bottom or allow the ship to explode it by contact. In deep channels the submarine mines are buoyant; in comparatively shallow waters they are placed upon the bottom; the object in both cases being to touch or nearly approach the hull of the vessel. Submarine mines are not accessories of the defense, but are essential features whenever they can be applied. Bomb-proof operating rooms and tunnels for the conveyance into the water of the electric cables are necessary parts of the system, and must be constructed in advance of the occasion for their use. . . . Heavy batteries and submarine mines are correlative terms of a good defense from the shore. Without powerful guns in the defense the armored ships of the enemy would proceed deliberately to the removal of the mines, either ignoring or silencing the fire of the works, and without the aid of the mines the enemy's vessels could not generally be prevented from running past the batteries."

Special batteries of guns were to be installed for the defense of the lines of mines against the attempt of unarmored or light-armored boats to countermine or grapple for their attachments. When practicable, every mine-field should be commanded by electric search-lights, so that the enemy's attempts at night to tamper with the mines may be detected and rendered abortive.

The necessities of each of the above harbors were studied in the light of the best information available, and the board made definite recommendations as to the number of guns and mortars, submarine mines, electric lights, and local floating defenses necessary for each harbor.

The first fortification appropriation act designed to carry out the recommendations of the Endicott Board was approved September 22, 1888. This act created the Board of Ordnance and Fortification, and made appropriations for commencing the manufacture of modern seacoast ordnance, but made no provision for the construction of any batteries. The first appropriation for the construction of gun and mortar batteries was contained in the act of August 18, 1890, since which time appropriations of varying amounts have been made regularly each year for carrying forward the adopted scheme of coast defense—for the manufacture of ordnance, or the construction of batteries, and for the necessary torpedo defenses.

The defensive details for each locality have been carefully elaborated from time to time by the Board of Engineers in projects which have received the formal approval of the Secretary of War prior to the actual beginning of any work. Up to 1902 projects for permanent seacoast defenses were adopted for thirty-one localities in the United States, as follows: Penobscot River, Maine: Kennebec River, Maine; Portland, Maine; Portsmouth, N. H.; Boston, Mass.; New Bedford. Mass.: Narragansett Bay, R. I.; eastern entrance to Long Island Sound: New York, N. Y.; Philadelphia. Pa.: Baltimore, Md.; Washington. D. C.: Hampton Roads, Va.; entrance to Chesapeake Bay at Cape Henry; Wilmington, N. C.; Charleston, S. C.; Port Royal, S. C.; Savannah, Ga.; Saint John's River, Fla.; Key West, Fla.; Tampa Bay, Fla.; Pensacola, Fla.; Mobile, Ala.; New Orleans, La.; Sabine Pass, Tex.; Galveston, Tex.; San Diego, Cal.; San Francisco, Cal.; mouth of Columbia River, Oregon and Washington; Puget Sound, Wash.; Lake Champlain.

Of the existing projects for the United States, as enumerated above, many have from time to time been revised to keep pace with the changes in ordnance and ships' armament and construction. At the time the scheme of coast defense was formulated by the Endicott Board, the rapid-fire gun was in its infancy, and ships were characterized by their extremely heavy armament and great thickness of armor. With the rapid development of this weapon and the increase in the resisting powers of armor by means of the Harvey and Krupp processes, there has followed a material change in ship construction, necessitating corresponding changes in the details of coast defenses. In accordance with the recommendations of the Endicott Board, the earlier detailed projects contemplated mounting a considerable number of the heaviest guns at the more important harbors in armored works. The tendency toward a reduction in calibres of heavy guns, coupled with the adoption of a disappearing carriage (see illustration under ORDNANCE) for the 12-inch gun, has, up to the present time, rendered armored defenses unnecessary, and the United States has thus far not embarked upon the construction of armored casemates and turrets, to which many European governments stand committed for their land defenses. Although rapid-fire guns were proposed in the earlier projects, no definite numbers or calibres were assigned until 1896, since which time nearly all of the earlier projects have been subjected to revision, resulting in the incorporation of a definite programme as to the rapid-fire armament, a reduction in the number and calibre of the heavy guns, a reduction in the number of mortars, and the general elimination of armored defenses. These revisions have resulted in marked economies, without any sacrifice to the defensive requirements, and they will be continued as changes in ordnance and ships or other causes may render them desirable.

While the inauguration of the modern system of seacoast defenses for the United States dates from 1890, when the first appropriation for constructing gun and mortar batteries was made, it was not until 1896 that Congress began making appropriations commensurate with the magnitude of the undertaking. Stimulated by the larger appropriations of recent years and the War with Spain, the seacoast defenses of the United States were, in 1902, eleven years after the actual commencement of the work, about 50 per cent. completed. Twenty-five of the principal harbors of the United States possess a sufficient number of heavy guns and mortars mounted to permit of an effective defense against naval attack, and considerable progress has been made toward the installation of an adequate rapid-fire armament, which is now a matter of first importance. Most of the heavy guns are now in position, a considerable portion of the light rapid-fire emplacements and some of the rapid-fire guns are completed, while a beginning has been made of inaugurating the systematic installation of search-light apparatus for night defenses. All torpedo material necessary to enable a quick and effective defense to be made is in store at each harbor for which torpedo defenses are at present projected. With few exceptions, all harbors are now equipped with torpedo storehouses, cable-tanks, and mining casemates.

Extensive torpedo experiments, with a view to improvements in the adopted system, have been carried on at the United States Engineer School and elsewhere, and such experiments, as well as inventions or ideas submitted by individuals, are considered by a board of officers known as the Board on the Torpedo System.

FEATURES OF CONSTRUCTION. Large direct-firing guns are now usually mounted singly, with traverses between them to protect them from enfilade by distant hostile fire, and to limit the destructive effects of projectiles landing in adjacent emplacements. The distances between the guns vary with their size and with the nature of the ground. Where possible, in the case of the larger guns, it is rarely less than 100 feet. Mortars for indirect firing are mounted in pits containing four mortars each. The first requirement for the mounting of a modern gun is a proper foundation from which the gun may be fired, and which will permit it to traverse freely and accurately. While modern guns, as already indicated, have increased remarkably in power in recent years, the weight of the gun proper has not increased in the same ratio. The usual precautions governing the design of foundations for heavy structures of course hold in the case of guns and mortars, in proportion to their weight. The great increase in power of modern guns has, in addition, rendered corresponding precautions necessary to prevent the gun and carriage from being overturned by the recoil of the piece. Provision is made for offsetting the strain transmitted to the foundation by the weight and distribution of the material of the latter. In the case of some of the high-power English guns, this has resulted in the construction of practically solid concrete bases 25 feet in diameter and 10 feet deep. The traverse circle of the carriage is connected with this base by steel bolts two inches in diameter and extending nearly to the bottom of the base of concrete. A loading platform of suitable dimensions on which the men can work while loading the gun is provided in the rear of the gun. As modern ordnance is loaded at the breech instead of at the muzzle, as was the case for most ordnance used even so recently as during the time of the Civil War, the service of the gun is considerably expedited, and the cannoneers are enabled to work in more safety under the cover of the parapet. The latter is a matter of considerable importance, and is placed in front of the gun, connecting with the traverses on the side. Where the gun is mounted on a disappearing carriage its muzzle projects over the parapet only in the firing position and recoils to a position in rear of the parapet for loading. If mounted on a barbette carriage, the gun stands permanently with its muzzle projecting above the parapet. (See illustrations in articles ORDNANCE and COAST ARTILLERY.) The thickness which should be given the parapet is an open question among engineers. The rule laid down by some of the best authorities is that it should be 50 per cent. thicker than the greatest penetration of any projectile liable to strike it. The modern method of constructing parapets is to make them of a mass of sand supported by thick retaining walls of concrete immediately in front of the gun. Experience has shown that projectiles striking in the front slope of a thick mass of sand thus backed will usually be deflected upward and pass out through the superior slope of the parapet, doing little damage to it, as the sand drops back approximately into place. Lewis gives the thickness of the concrete retaining wall immediately in front of the gun for English emplacements for high-power guns at from 10 to 15 feet. The superior or upper slope, both of concrete and earth, have a slight slope to the front. The front slopes run off into the natural surface of the ground, and in this and other ways the concealment of the battery is secured in order to make it a difficult target for the enemy on the water.

The main magazine for a fort should consist of a building or buildings at suitable places convenient of access, in which powder in bulk, blank cartridges, shell, etc., may be stored. The service magazine immediately at the gun emplacement should have a capacity for 200 rounds of powder stored in cases and served to the lift by hand, 100 rounds of shell and shrapnel, and 100 rounds of armor-piercing shell served by overhead trolleys to the lifts or cranes. At the time of the Civil War in the United States projectiles had not yet attained a weight too great to be handled by hand by two men. Now the largest of them weigh half a ton, and special appliances in the way of trolleys and wheeled trucks must be provided for handling them expeditiously. Magazines and shell-rooms are placed where most convenient in view of the nature of the ground and the positions of the guns. Frequently they are in the traverses between guns. In view of the disastrous effects that may result from the explosion of a magazine, special precautions are taken to exclude hostile projectiles from it. This is accomplished by placing it in a relatively lower position than the gun, and giving its walls an ample thickness of masonry and earth covering. Moisture is injurious to powder, and although the latter may be ordinarily kept in waterproof cases, many precautions are taken to exclude dampness from the magazines. In view of the fact that the service magazines are of necessity near the coast, and that the air around them frequently contains much moisture, the problem is a difficult one. Careful attention is given to drainage, so that the surface water may be carried off as rapidly as possible. Air-spaces and French drains are provided to intercept water penetrating the mass of the cover. The masonry walls are made as tight as possible and waterproofed. By these means the infiltration of water is prevented. Condensation will, however, occur when damp air is admitted to the magazine and strikes the walls and material at a temperature below its dew-point. The prevention of condensation is a problem of relative heat and cold, and is usually met by attempts at careful regulation of the ventilation, admitting air so far as possible only at times when it is the driest. The walls are also sometimes lined with brick, with a view to absorbing water which may be deposited on them if the magazines must be opened for a short time at unfavorable periods.

In a modern fortification there are many elements to be considered. Living-rooms for the cannoneers are sometimes built in the emplacements. Provision must be made for lighting the emplacements, magazines, etc., in case of action at night. This was formerly done by means of lamps, but recently in the United States standard specifications have been prepared by a board of engineer officers for electric light and power installations at seacoast batteries. Lookouts for the observation of gun-fire must be built in the flanks of the emplacements, and stairs and ramps provided where necessary in the emplacement for free and easy communication between its various parts.

In the United States the regulations concerning the promulgation of information relative to the permanent works of defense are quite explicit, and forbid the publication of many interesting and significant facts concerning the more modern fortifications. A paragraph in the Army Regulations provides that, "The taking of photographic or other views of permanent works of defense will not be permitted. No written nor pictorial descriptions of these works will be made for publication without the authority of the Secretary of War, nor will any information be given concerning them which is not contained in the printed reports and documents of the War Department." Accordingly, for descriptions of these fortifications, recourse must be had to these reports. The principal ones containing information on the subject are the reports of the chief of engineers of the army, including the reports of the district constructing officers, and the Drill Regulations for Coast Artillery. For the best work of reference, aside from these official sources, consult Abbot, *Defense of the Seacoast of the United States* (New York, 1888). In England, several excellent works on this subject have been prepared for general sale, among which may be mentioned Clarke, *Fortification* (London, 1890), and the various Chatham manuals. See, further, the various articles in this Encyclopædia dealing with military and naval subjects. The use and disposition of troops is discussed under TACTICS, MILITARY; the methods of coast defense are treated under that title; while the various weapons used are described in such articles as ARTILLERY; ORDNANCE; TORPEDOES; COAST ARTILLERY; FIELD ARTILLERY; GUNS, NAVAL; HORSE ARTILLERY; RAPID-FIRE GUNS; ARMOR PLATE; PROJECTILES, etc.

FORTIFICATIONS, ATTACK AND DEFENSE OF. The construction and nature of fortifications have been considered under FORTIFICATION; the present article will discuss the tactics involved in their attack and defense. The subject in its essence is more appropriately treated under SIEGE AND SIEGE WORKS; but in some respects the tactics of field artillery (see TACTICS, MILITARY), with certain necessary modifications, find application, and the latter are considered here. The attack of a fortification is a planned attack on a prepared position; but the field material is supplemented by siege artillery and engineer work. The attack and defense proceed as in the field; the infantry of the attack occupies the foreground; the siege guns are placed in position under its protection, the guns of the defender are silenced, and the nearer means of defense are destroyed. Meanwhile the infantry moves gradually forward, and finally takes the position by storm. On both sides the work is carried on with energy, to prevent the enemy from having any rest in his work.

The cavalry first incloses the fortification and remains in observation; the infantry then occupies its position deliberately, directing its forces against at least two of the fronts of the fortification, in order to deceive the enemy, preparing against surprise by means of very strong outposts, especially on the front, selected for actual attack, and the latter must generally intrench themselves. As soon as the guns of the enemy are silenced, the works of the enemy are destroyed by the heavy artillery. The infantry can only advance under cover, consequently the outposts are first advanced, and then their previous position is improved during the night to serve as an infantry position, not by running continuous lines (parallels), but by constructing groups of fortifications previously laid out by the engineer officers. Where the infantry cannot be brought forward under natural cover, zigzag approaches must be run. If the infantry position is too far to the rear for the final assault, another, and often a third, must be prepared farther to the front. If the heavy artillery fails to destroy the enemy's works flanking the ditch, the attacker will be forced to begin the tedious engineer attack by the sap. Otherwise the assault is ordered, and is preferably begun in the early morning, and the attack is directed on a broad front. Several false attacks are made at the same time, to deceive the enemy if possible.

The same principles apply in the defense, activity and the offensive being predominant. In the early stages the infantry must go out in the open to attack, but in the later the defense becomes purely passive. See SIEGE AND SIEGE WORKS.

FOR′TINBRAS. The Prince of Norway, in Shakespeare's *Hamlet*. He covets the lands lost by his father to Denmark, and finally makes an invasion into the latter kingdom. He arrives on the scene in the last act, in time to see Hamlet's death and claim the realm. The part is usually omitted from acting versions.

FORT IN′DEPEN′DENCE. A fortification on Castle Island, Boston Harbor, Mass., built on the site of the former Castle William.

FORTIS, fôr′tês, Abbe GIOVANNI BATTISTA (1741-1803). An Italian traveler and naturalist, born in Padua. He became an Augustinian monk, but was unfitted for a monastic life, and spent his time in travel, studying the natural history of the regions he journeyed through, and recounting his adventures and investigations in writing. His publications include: *Saggio d'osservazioni sopra l'isola di Cherso ed Osero* (1771); *Viaggio in Delmazia* (1774), his best-known work, containing an interesting collection of the folk-songs of the Serbs and Croats; *Della valle vulcanico-marina di Roma* (1778); *Versi d'amore e d'amicizia* (1783); *Mémoires pour servir à l'histoire naturelle et principalement à l'oryctographie de l'Italie, etc.* (1802).

FORT JACK′SON. A fort on the right bank of the Mississippi, 78 miles below New Orleans, famous for its resistance to Farragut's fleet and its final capture by the Federals in 1862. It was built in 1824-32, and was enlarged and repaired in 1841. Together with Fort Saint Philip, on the opposite bank, a half-mile above, it defends New Orleans from maritime attack. After the passage of the South Carolina ordinance of secession, on December 20, 1860, the State authorities of Louisiana seized these forts, strongly fortified them, and stationed a fleet above. In the spring of 1862, a Federal expedition was organized against New Orleans, and the Confederates, soon hearing of it, greatly strengthened the two forts. The expedition, under the command of Captain Farragut, arrived at the mouth of the Mississippi in March, and on April 18th the powerful mortar flotilla under Commander D. D. Porter opened fire with terrible effect upon the forts. At 2 A.M. on the 24th Farragut's fleet started in single line up the river, and, in the face of a tremendous fire from the two forts and from a Confederate fleet, succeeded in passing first Fort Jackson and then Fort Saint Philip. Soon afterwards the city was occupied by Federal troops, and on the 28th both Fort Jackson and Fort Saint Philip capitulated to Commander Porter, who had remained below. The two forts were under the command of Brig.-Gen. J. K. Duncan, and were garrisoned by about 700 men each. Fort Jackson was under the immediate command of Lieut.-Col. Edward Higgins. The loss of the Federals was 37 killed and 147 wounded, while that of the Confederates is not definitely known. Consult: Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. ii. (New York, 1887); Mahan, *Admiral Farragut* (New York, 1892); and Nicolay and Hay, *Abraham Lincoln: A History*, vol. v. (New York, 1890).

FORT KEOGH, kē′ô. A United States military post in Montana, established in 1876, and comprising a reservation of 57,600 acres. There are a post-office and railroad and telegraph station at the post, which is situated on the Northern Pacific Railroad, 746 miles from Saint Paul, Minn. It was named for Capt. Myles Keogh, Seventh United States Cavalry, one of the victims of the Custer massacre. There are quarters for 27 officers and 390 men, and stables for 200 horses.

FORT LAFAYETTE, lä′fâ-ĕt′. A fort on the Long Island shore of the Narrows, New York Harbor, in front of Fort Hamilton.

FORT LEAV′ENWORTH. A United States military post in Kansas, established in 1827 by Colonel Leavenworth, U. S. A. The reserve comprises 6899 acres, all but 939 acres (timber) being on the west side of the Missouri River. It is about 500 miles above the junction of the Missouri with the Mississippi, on the Kansas City, Wyandotte and Northwestern and Missouri Pacific railroads. There are quarters and barracks for 100 officers and 1500 men, with stables for 1000 animals. The station of the general service and staff college (postgraduate), and a garrison comprising a due proportion of cavalry, artillery, infantry, and engineer troops, are located at the post, which has both post-office and telegraph station.

FORT LEE. A fort formerly situated in Bergen County, N. J., on the west bank of the Hudson River, along the lower Palisades. At the old fort here, opposite 160th Street, New York City, General Greene, with 2000 troops, narrowly escaped capture by a force of 5000

British under Cornwallis, on November 20, 1776. Warned just in time, he hastily evacuated the fort and retreated with Washington across New Jersey, leaving behind all his provisions and military stores.

FORT LO'GAN. A United States military post, established in 1887, and comprising a reservation of 640 acres, three miles from Denver, Colo. There are quarters and stables for a squadron of cavalry.

FORT McALL'ISTER. A strong earthwork, erected by the Confederates during the Civil War on Genesis Point, on the right bank of the Great Ogeechee River, six miles from Ossabaw Sound, and 12 miles south of Savannah, Ga. Early in 1863 Admiral Du Pont, wishing to give the recently constructed monitors a preliminary trial before using them against Fort Sumter (q.v.), ordered the *Montauk* (Commander J. L. Worden), assisted by the gunboats *Seneca, Wissahickon, Dawn,* and *Williams,* to attack Fort McAllister. Bombardments occurred, without serious damage either to the fleet or the fort, on January 27th and February 28th, the Confederate privateer *Nashville,* which had grounded near the fort, being destroyed on the latter day. On March 30th an eight-hour attack, with little effect, was made by the monitors *Passaic, Patapsco,* and *Nahant,* under Commander Drayton. Finally, on December 13, 1864, the fort was assaulted and captured by General Hazen's division of General Sherman's army. This was the concluding operation of Sherman's march to the sea, and led to the surrender of Savannah several days later. Consult: Ammen, *The Atlantic Coast* (New York, 1883); Johnson and Buel (editors), *Battles and Leaders of the Civil War,* vol. iv. (New York, 1887); and Sherman, *Memoirs,* vol. ii. (New York, 1875).

FORT McHEN'RY. A United States military post, established in 1794. It occupies a reservation of 35 acres, on Whetstone Point, Patapsco River, Md. The post-office and telegraph station are Baltimore, Md., from the centre of which city it is distant three miles. Its site was first occupied for military purposes in 1775. In 1794 it was established as a permanent fortification, and was named after James McHenry, one of Washington's private secretaries during the Revolution, and Secretary of War, 1798. In September, 1814, it successfully withstood a bombardment by the British fleet under Admiral Cockburn. It was this attack which suggested to Francis S. Key his famous ode, "The Star Spangled Banner." During the Civil War the fort was used as a rendezvous and military prison. In 1902 there was an artillery garrison of four companies. Forts Armistead and Carroll are subposts.

FORT MA'CON. A fort commanding Beaufort Harbor, N. C., taken by Federal land and naval forces on April 26, 1862.

FORT McPHER'SON. A United States military post, established in 1867 as McPherson Barracks, and now located on a reservation of 236 acres, acquired by the United States Government in 1886, and situated four miles south of Atlanta, Ga. There are post-office and telegraph stations at the post. There are quarters for four companies of infantry.

FORT MAD'ISON. A city and the county-seat of Lee County, Iowa, 18 miles southwest of Burlington; on the Mississippi River, and on the Atchison, Topeka and Santa Fé and the Chicago, Burlington and Quincy railroads (Map: Iowa, F 4). It is the seat of the State penitentiary, and has the Catermole Memorial Library, and several public parks. A fine railroad and wagon bridge crosses the river at this point. There are pork-packing houses, shops of the Atchison, Topeka and Santa Fé Railroad, foundries and machine-shops, flour and saw mills, farm-implement works, wrapping-paper mills, car-wheel works, and manufactures of automobiles, buttons, boots and shoes, chairs, boxes, tools, etc. Fort Madison was settled in 1832, on the site of a fort dating from 1808, and was incorporated as a town in 1836. The government is administered by a mayor, elected every two years, and a unicameral council. Population, in 1890, 7901; in 1900, 9278.

FORT MEADE. A United States military post, established in 1878, and occupying a reservation of 7842 acres, in Meade County, near Sturgis, S. D., on the Fremont, Elkhorn and Missouri Valley Railroad. There are quarters for 25 officers and 500 men, and stables for 600 horses. It was improved and modernized in 1902.

FORT MEIGS, mĕgz. A former fort at the Maumee Rapids, in northwestern Ohio, famous for its defense by the Americans against the English and Indians during the War of 1812. General Harrison had established his advanced post here after the 'Massacre of the River Raisin' (see FRENCHTOWN), and on May 1, 1813, the British General Proctor, at the head of more than 2200 men (including about 1500 Indians under Tecumseh), began an attack, which lasted, with little intermission, until the 5th. On this day an American reinforcement of about 1100 men, under Gen. Green Clay, arrived, and a battle, or series of battles, ensued, without decisive result. Proctor, however, seeing the hopelessness of further attack, and being considerably weakened by Indian defections, withdrew from the vicinity of the fort on the 9th. Consult: Dawson, *Battles of the United States* (New York, 1858); and Lossing, *Pictorial Field Book of the War of 1812* (New York, 1868).

FORT MER'CER. An abandoned fort at Red Bank, N. J., on the Delaware River, which during the Revolutionary War formed one of the defenses of the city of Philadelphia. Immediately after occupying Philadelphia, in 1777, Sir William Howe (q.v.) perceived the necessity of securing Forts Mercer and Mifflin, in order to open communication by water with New York, and thus prevent the forcing of his army into a state of siege. Late in October, accordingly, a force of about 2500 picked men, mostly Hessians, under Colonel Donop, was sent against Fort Mercer, and a supporting fleet was ordered up the river. On the 22d the Hessians attacked with vigor, but were fiercely beaten back by the small American garrison, numbering 300, under Col. Christopher Greene, and were finally forced to withdraw. After the capture of Fort Mifflin (q.v.), Fort Mercer was abandoned (November 20th) by the Americans, and soon afterwards was destroyed by the British. Consult: Dawson, *Battles of the United States* (New York, 1858); and

Lowell, *The Hessians in the Revolution* (New York, 1884).

FORT MIFF'LIN. A fort on Mud Island, in the Delaware River, near the mouth of the Schuylkill River. It is one of the defenses of the city of Philadelphia, and in American history is well known for its siege and capture by the British during the Revolutionary War. Together with Fort Mercer (q.v.), on the New Jersey shore, it controlled the approach by water to Philadelphia, and when that city was captured by Sir William Howe, in 1777, shut the British off from communication with their fleet, and obstructed the passage of supplies. On October 23d it was bombarded for several hours, but with little effect, by a British fleet, assisted by a land battery, an American fleet (called the Pennsylvania Navy), under Col. John Hazelwood, coöperating with the fort, which was then garrisoned by only 300 men, under Col. Samuel Smith. Finally, the British erected a strong battery on Province Island, and greatly reinforced their fleet. On the 10th of November they again attacked, and after an almost constant bombardment for six days the Americans evacuated the fort and crossed over to Fort Mercer. An extended account of Fort Mifflin during the Revolution is given in Wallace, *An Old Philadelphian, Colonel William Bradford* (Philadelphia, 1884). Consult also Dawson, *Battles of the United States* (New York, 1858).

FORT MIMS, Massacre of. An Indian massacre on August 30, 1813, during the Creek War, at Fort Mims, a temporary stockade 35 miles north of Mobile, Ala. On the outbreak of the war, 553 men, women, and children had assembled here for protection, under the command of Dixon Bailey; but were surprised by a greatly superior force of Indians, under the half-breed Weathersford, at noon on August 30th, and, though they offered brave resistance, all of them were killed, except 15 who escaped, and a few negroes and half-breeds, who were taken prisoners. Consult: Pickett, *History of Alabama*, vol. ii. (Charleston, 1851); Lossing, *Field Book of the War of 1812* (New York, 1869); and Dawson, *Battles of the United States* (New York, 1858).

FORT MONROE'. A United States military post, situated at Old Point Comfort, Elizabeth City County, Va., and commanding the entrance to Hampton Roads. There is a post-office and telegraph station at the post, which includes a reservation of 282 acres. The station of the Artillery School (postgraduate), with quarters for 50 officers and 600 men, is located here. For two years after the close of the Civil War Jefferson Davis (q.v.) was imprisoned here.

FORT MONTGOM'ERY. A fort on the Hudson, near West Point, intended to close the river against the British fleet in 1777.

FORT MOR'GAN. A United States military post in Alabama, occupying a reservation of 322 acres on Mobile Point, the eastern entrance to Mobile Bay, 33 miles from Mobile. The post-office is Mobile, and there is a telegraph station at the post. The garrison in 1902 consisted of two companies of coast artillery. See Mobile Point.

FORT MOULTRIE, mōl'trĭ. A fort on Sullivan's Island, at the entrance to Charleston Harbor, notable for its defense against the British in the Revolutionary War. In the summer of 1776 Sir Peter Parker, with a fleet, and Sir Henry Clinton, with a force of British regulars, proceeded to Charleston Harbor for the purpose of taking Charleston, and of using that place as a base of operations against the Southern Colonies. A total American force of about 6500 had assembled for the defense of Charleston, of which 435, under Col. William Moultrie, were stationed in an unfinished fort, then known as Fort Sullivan, at the eastern end of Sullivan's Island. On June 28th Sir Henry Clinton took up a position on the sand-bank near Sullivan's Island, with the intention of crossing over and making a land attack. Meanwhile Sir Peter Parker, with his fleet, made a vigorous attack on the fort; but, after an artillery duel lasting almost ten hours, was forced to withdraw. Owing to the depth of the shoals, through which he had expected to reach Sullivan's Island, Clinton was detained on the sand-bank, and virtually took no part in the engagement. The effect of the victory was to insure the Southern States from invasion for almost two years. Subsequently the name of the fort was changed to Fort Moultrie. On May 7, 1780, a short time before the capture of Charleston by the British, the fort was forced to surrender.

Immediately before the outbreak of the Civil War, Fort Moultrie was occupied by the United States garrison assigned for the defense of Charleston Harbor; but on December 26, 1860, the fort being virtually unprotected from land attack, and hostilities appearing imminent between the Federal and State forces, Major Anderson removed the garrison to Fort Sumter (q.v.). A detachment of South Carolina militia promptly took possession, and subsequently during the war Fort Moultrie formed one of the important defenses of Charleston against Federal attacks. Consult: Dawson, *Battles of the United States* (New York, 1858); and McCrady, *History of South Carolina in the Revolution, 1775-80* (New York, 1901).

FORT MY'ER. A United States military post in Virginia, occupying a reservation of 186 acres, on the west bank of the Potomac River, opposite Washington, D. C., which is the telegraph station. There are post-office and telephone at the post, which was named after Gen. A. J. Myer, the founder of the Signal Service, U. S. A. It has quarters for 33 officers and 300 men, and stables for 450 horses.

FORT NIAG'ARA. A fort at the mouth of the Niagara River, on the American side. La Salle seems to have built a house here in 1669, and a fortified trading-post, called Fort Conti, ten years later; but both were soon destroyed. In 1686 Denonville built here a fort, which was named in his honor. Soon afterwards this place was besieged by the Senecas. In September, 1688, the fort was destroyed and abandoned; but in 1725-26 Vandreuil built here another fort, called Fort Niagara, which was destined to be more permanent, and which was soon recognized, not only as the most important military station on the Great Lakes, but also as perhaps the greatest trading-post in the country. During the French and Indian War it was the objective point of a futile expedition under Governor Shirley of Massachusetts in 1755, and in July, 1759, after a siege of about sixteen days, was captured by a British and Indian force under Sir William Johnson. In July, 1764, important treaties were made here by Sir William Johnson with various Indian tribes who had participated in Pontiac's War. During the Revolutionary War the fort was the starting-point of many expeditions sent to ravage the Western frontier, was the headquarters for a time of John Butler and Joseph Brant, and was the place where the Wyoming and Cherry Valley expeditions were organized. Finally, in August, 1796, it was evacuated by the British, in accordance with the Treaty of 1783, and was immediately occupied by an American garrison. It was bombarded from Fort George (q.v.), on October 13-14, 1812; was captured by the British on December 19, 1813; and was again surrendered to the United States on March 27, 1815. In May, 1826, various circumstances having combined to make the fort relatively unimportant from a military point of view, the United States garrison was wholly withdrawn. Consult: Porter, *A Brief History of Old Fort Niagara* (Niagara Falls, 1896); Marshall, *The Niagara Frontier* (Buffalo, 1865); and Severance, *Old Trails on the Niagara Frontier* (Buffalo, 1889).

FORT NINETY-SIX (S. C.). See NINETY-SIX.

FORTOUL, fôr'tōōl', HIPPOLYTE NICHOLAS HONORÉ (1811-56). A French author and statesman, best known for his educational policy under the Second Empire. He was born at Digne, and in 1845 became a professor of literature at Toulouse, and afterwards at Aix. In 1849 he was elected Deputy from the Department of Basses Alpes, and joined the party of Louis Bonaparte. After a few months in the Ministry of Marine, he became, on the coup d'état, Minister of Public Instruction, and did his best to serve the new régime, especially in carrying out the law of 1850, in its narrow opposition to the university. He stopped the courses of Jules Simon at the Sorbonne, and retired Quinet, Mickiewicz, and Michelet from the Collège de France; suppressed the chair of philosophy and replaced it by a chair in logic; and introduced the quasi-elective system of bifurcation, or division of science from letters. This last plan, and the introduction in general of practical features—farming in the primary schools and drawing in the *lycées*, for example—were the only points in which Fortoul showed himself an educator, and not a mere politician.

FORT PAYNE. A city and the county-seat of De Kalb County, Ala., 92 miles northeast of Birmingham; on the Alabama Great Southern Railroad (Map: Alabama, D 1). It has coal and iron mining interests, and among its industrial establishments are iron-works, lumber-mills, fire-clay works, etc. Population, in 1890, 2698; in 1900, 1037.

FORT PICK'ENS. A fort on Santa Rosa Island, Fla., commanding the entrance to Pensacola Harbor, and intended as a defense to the harbor and the United States Navy Yard at Warrington. Early in 1861, at the outbreak of the Civil War, it was under the command of Lieut. Adam J. Slemmer (q.v.), who transferred hither the small garrison of Fort Barancas, directly opposite, and with a force numbering only 81, withstood for some time a siege by a large force of Confederates under Capt. Braxton Bragg (q.v.). Federal reinforcements, under Col. Harvey Brown, arrived in the middle of April to relieve Slemmer and his garrison, and the fort was held by the Federals throughout the war.

FORT PIL'LOW. A fort in Tennessee, on the east shore of the Mississippi River, about 40 miles north of Memphis, the scene of the so-called 'Massacre of Fort Pillow' during the Civil War. It was constructed by the Confederates, under the direction of General Pillow, in the spring of 1862; but was abandoned and dismantled by them on May 25th of the same year, and on June 5th was occupied by a small Federal force. Subsequently it was a starting-point for a number of Federal raids, but was regarded as of relatively little strategic importance, and was never strongly garrisoned. On April 12, 1864, it was attacked by a strong Confederate force under Gen. Nathan B. Forrest (q.v.). After offering a stubborn resistance, prolonged even when capture had become inevitable, the garrison was overpowered and almost annihilated. The Confederates were accused of having deliberately massacred the Federals, fully half of whom were negroes, after the latter had surrendered, and color was given to the charge by Forrest's summons to surrender, which closed with the words: "Should my demand be refused, I cannot be responsible for your command." The testimony, moreover, of the survivors almost unanimously confirmed the charge. On the other hand, Forrest and his officers always asserted that the resistance of the garrison was insanely and recklessly prolonged; that the garrison never surrendered; that the Confederates ceased firing as soon as one of their own officers had cut down the United States flag; and that no prisoners, white or colored, were killed or maltreated. The Confederate loss was 20 killed and 60 wounded. Consult: Johnson and Buel (editors), *Battles and Leaders of the Civil War*, vol. iv. (New York, 1887); Nicolay and Hay, *Abraham Lincoln: A History*, vol. vi. (New York, 1890); Wyeth, *Life of General Forrest* (New York, 1899); and Mathes, *General Forrest* (New York, 1902), in the "Great Commanders Series."

FORT POR'TER. A United States military post, established in 1867, on a reservation of 28 acres, on the Niagara River, within the limits of the city of Buffalo, which is the post-office and telegraph station. Originally, in 1844, there was a defensive work at Black Rock. The fort has quarters for 15 officers and 225 men.

FORT PREBLE, prĕb''l. A United States military post, established in 1808, and occupying a reservation of 24 acres at Spring Point, on the east side of Portland Harbor, Maine, two miles from the city of Portland, which is the post-office and telegraph station. Its garrison in 1902 was two companies of coast artillery.

FORT PULAS'KI. A fort erected on Cockspur Island, Ga., for the defense of the Savannah River. It was occupied by the Confederates at the beginning of the Civil War, and on April 11, 1862, after a virgorous bombardment, was captured by the Federals, its garrison then numbering 350 men, under Col. Charles H. Olmstead.

FORTRESS. See FORTIFICATION.

FORTRESS ARTILLERY. See COAST ARTILLERY; and ORDNANCE.

FORTRESS MONROE. See FORT MONROE.

FORT RI′LEY. A United States military post, established 1852, on a reservation of 19,899 acres, on the Kansas River, 3½ miles from Junction City, Kan., which is the telegraph station, post-office, and station of the Kansas Pacific Railroad at the post. This post was first known as Camp Centre, it being considered the geographical centre of the United States; but subsequently was named after Gen. B. C. Riley, U. S. A. It is the station of the United States Cavalry and Field Artillery School (postgraduate), and has quarters for 50 officers and 1350 men, with stables for 1000 horses.

FORT ROB′INSON. A United States military post, on White River, 3 miles from Crawford. Neb. There are post-office and telegraph stations at the post, which has quarters for 520 men, and cavalry stables for 530 horses. It was established in 1874, and occupies a reservation of 20 square miles.

FORT ROY′AL. See FORT DE FRANCE.

FORT SAINT PHIL′IP. See FORT JACKSON.

FORT SAM HOUSTON, hū′ston. A United States military post, established in 1865, as the post of San Antonio, Tex., and occupying a reservation of 469 acres, near the city of San Antonio, which is the telegraph station. There is a post-office at the post. There are quarters for 35 officers and 700 men, and stables for 520 animals.

FORT SCHUYLER, skī′lẽr. See FORT STANWIX; and Rome, N. Y.

FORT SCHUYLER. A United States military post, which forms one of the defenses to the northern entrance to the harbor of New York. The post was established in 1856, although the fortification was begun in 1833. The reservation comprises 62 acres, on Throgg's Neck, Long Island Sound, 3½ miles from Westchester, which is the post-office and telegraph station. There are quarters for 9 officers and 120 men.

FORT SCOTT. A city and the county-seat of Bourbon County, Kan., 100 miles south of Kansas City; on the Marmaton River, and on the Kansas City, Fort Scott and Memphis, the Missouri, Kansas and Texas, and the Missouri Pacific railroads (Map: Kansas, H 4). It is the seat of the Kansas Normal College, and has a public library, an academy for girls, and Mercy Hospital. The city is in a region of great mineral wealth, deposits of coal, flagstone, cement rocks, clays, mineral paints, zinc, and lead being found. There are foundries and machine-shops, flouring-mills and grain-elevators, cement, pottery, brick, and tile works, etc. Population, in 1890, 11,946; in 1900, 10,322.

FORT SHER′IDAN. A United States military post, established in 1887, in the State of Illinois, on Lake Michigan, about 25 miles from Chicago. The reservation comprises 632 acres. There is a post-office and telegraph station at the post, which has quarters for a regiment of infantry and a battalion of field artillery.

FORT SMITH. A city and one of the county-seats of Sebastian County, Ark., at the junction of the Arkansas and Poteau rivers, and on the Saint Louis and San Francisco, the Missouri Pacific, the Kansas City Southern, and other railroads (Map: Arkansas, A 2). It has important wholesale jobbing interests in groceries, meats, dry goods, drugs, furniture, leather goods, etc.; a large trade in coal, corn, cotton, lumber, live stock, and hides; and extensive manufactures of furniture. There are also sawmills, planing-mills, cottonseed-oil mills, etc. Settled in 1838, Fort Smith was first incorporated in 1842, and was chartered as a city of the first class in 1886. Its government is administered by a mayor, chosen biennially, who nominates the board of health, chief of police, and chief of the fire department, and a city council, elected on a general ticket, which controls the appointments to the other municipal offices, excepting the board of school directors, who are elected by the people. The school district has a large fund, derived from the sale of lands donated by the Government; this, with the revenue accruing from taxation, has enabled the city to build a number of fine public schools, the most notable of which is the high school, costing $60,000. Population, in 1890, 11,311; in 1900, 11,587.

FORT SNEL′LING. A United States military post in Minnesota, at the junction of the Minnesota and Mississippi rivers, seven miles from Saint Paul and eight miles from Minneapolis. It was established in 1820, and embraces a reservation of 1531 acres. There are a post-office and telegraph station at the post, which was named after Col. Josiah Snelling, U. S. A., its first commander. It has quarters for 37 officers and 520 men.

FORT STAN′WIX. A fort built in 1758, by Brigadier Stanwix, on the site of the present Rome, N. Y., and near the spot where another fort, soon abandoned, had been built in 1756. From its location on the watershed between Lake Ontario and the Hudson, it commanded the principal line of communication between New York and Upper Canada. Here, in the fall of 1768, a treaty was negotiated by Sir William Johnson with the Six Nations, about 3200 Indians being present. The latter agreed, for the sum of $10,000 in money and goods, to surrender their title to a vast tract of territory which now constitutes Kentucky, West Virginia, and the western part of Pennsylvania. Soon afterwards the fort was dismantled; but in 1776 it was rebuilt and named Fort Schuyler, in honor of Gen. Philip Schuyler. In the following year Col. Peter Gansevoort, with a garrison of about 750, held it from August 3d to August 22d against Saint Leger, with a force of about 1700 British regulars, Tories, and Indians. The fort was destroyed by flood and fire in 1781, but was subsequently rebuilt again as Fort Stanwix, and here, on October 22, 1784, Oliver Wolcott, Richard Butler, and Arthur Lee, acting on behalf of the Continental Congress, negotiated an important treaty with the Six Nations.

FORT STE′PHENSON. See FREMONT, Ohio.

FORT STE′VENS. A United States military post, at the mouth of the Columbia River, 110 miles from Portland, Ore. It was established in 1864, and includes a reservation of 1250 acres. There are post-office, telegraph, and railroad stations at the post, which has quarters for six officers and two companies of artillery.

FORT STRONG. A United States military post, on the east end of Long Island, Boston Harbor, Mass. The garrison consists of two companies of coast artillery, and there are connected, as subposts, Forts Andrews and Standish.

FORT SUM′TER. A fort on an island at the entrance of Charleston Harbor, about three miles from Charleston, the firing upon which by the Confederates, in April, 1861, precipitated the Civil War. Work was begun on the fortifications about 1830, but was subsequently discontinued, and in 1860 the fort was still in an unfinished condition. For illustration, see Plate of FORTIFICATIONS. On November 21st Major Robert Anderson replaced Col. J. L. Gardner as commander of the forts in Charleston Harbor, and, like his predecessor, occupied Fort Moultrie (q.v.). Hostilities with the State forces appearing imminent, however, and Fort Moultrie being almost wholly unprotected against land attacks, he secretly removed his small garrison to Fort Sumter, on the evening of December 26th—six days after South Carolina had passed her ordinance of secession. Anderson and his small garrison applied themselves with energy to the strengthening of the fortifications. After much vacillation on the part of the Administration at Washington, an attempt was made in January, 1861, to relieve the scantily provisioned fort; but the *Star of the West,* a merchant vessel which had been sent for this purpose, and which arrived at the mouth of the harbor early on the 9th, was fired upon by the authorities and forced to put back. After the inauguration of President Lincoln, the policy to be pursued with regard to Fort Sumter was the subject of many Cabinet discussions, and, in large part, of the unofficial negotiations between Seward and the Confederate commissioners in Washington. (See CONFEDERATE STATES OF AMERICA.) On April 9th President Lincoln notified Governor Pickens that an attempt would be made to send provisions to the fort, and on the 11th, acting under orders from President Jefferson Davis, General Beauregard, in command of the Confederate forces at Charleston, demanded the evacuation of the fort. Anderson promptly refused to withdraw, though, after a prolonged conference with his officers early on the 12th, he wrote: "I will . . . evacuate Fort Sumter by noon on the 15th instant, and I will not in the meantime open my fires upon your forces, unless compelled to do so by some hostile act against this fort or the flag of my Government, . . . should I not receive prior to that time controlling instructions from my Government or additional supplies." This answer proved unsatisfactory, and the bombardment of the fort began at 4.30 A.M., though Anderson did not return the fire until 7 o'clock. Meanwhile, on the same morning, the relieving fleet sent by President Lincoln arrived at the mouth of the harbor, but was able to accomplish nothing. The artillery duel continued throughout the 12th, and during the morning and part of the afternoon of the 13th, when terms of evacuation were agreed upon between Anderson and Beauregard, the garrison, which consisted of only 128 men, leaving the fort on the following day with the honors of war. There was no one wounded or killed on either side during the bombardment. The contest was of immense importance, since it marked the beginning of the Civil War and put a stop to all peace plans and negotiations.

After taking possession the Confederates greatly strengthened the fort, both for offensive and defensive operations. On April 7, 1863, a Federal fleet of nine ironclads—the *Weehawken, Passaic, Montauk, Patapsco, New Ironsides, Catskill, Nantucket, Nahant,* and *Keokuk*—under Admiral Dupont, attacked the fort with great energy and gallantry; but after an engagement of about two hours and a half was repulsed, the *Keokuk* sinking on the following day, and several vessels being considerably damaged. General Gillmore, the commander of the land forces engaged against Charleston, established breaching batteries on Morris Island, and after a seven days' bombardment, August 17-23, 1863, virtually reduced the fort to ruins. Thenceforth it was garrisoned only by a small force of infantry, which held it in spite of frequent bombardments, a gallant boat attack made by a force of 400 men under T. H. Stevens, on the night of September 8, 1863, and of a disastrous magazine explosion on December 11, 1863, until February 17, 1865, when it was finally evacuated. During 1863-65 Fort Sumter was commanded successively by Colonel Rhett, Major Stephen Elliott, Capt. J. C. Mitchell, and Capt. T. A. Huguenin. On April 14, 1865, by order of Secretary Stanton, General (formerly Major) Anderson raised over the fort the same flag which he had been forced to lower exactly four years before. Consult: *Official Records,* Johnson and Buel (editors), *Battles and Leaders of the Civil War,* vols. i. and iv. (New York, 1887); Anderson, *Political Conspiracies Preceding the Rebellion; or, The True Stories of Sumter and Pickens* (New York, 1882); Crawford, *Genesis of the Civil War: the Story of Sumter, 1860-61* (New York, 1887); Doubleday, *Reminiscences of Forts Sumter and Moultrie in 1860-61* (New York, 1876); and Gillmore, *Report on Engineer and Artillery Operations Against Charleston in 1863* (Washington, 1865).

FORT TER′RY. A United States military reservation of 150 acres, on Plum Island, between Long Island Sound and Gardiner's Bay, N. Y. The post-office and telegraph station is New London, Conn. The works are garrisoned by two companies of coast artillery.

FORT THOMAS, tŏm′as. A United States military post, established in 1887, consisting of a reservation of 280 acres (including a rifle range of 169 acres). It is situated in Kentucky, on a bluff overlooking the Ohio River, 3 miles from Newport, Ky., and 4 miles from Cincinnati. There are post-office and telegraph station at the post. Quarters are provided for 31 officers and 9 companies of infantry.

FORT TOT′TEN. This post, for many years the headquarters of the United States Battalion of Engineers, was established in 1862, and was originally called Willets Point. The reservation comprises 136 acres on the East River at the western end of Long Island Sound, two and one-half miles from Whitestone. The post-office and telegraph station is Willets Point, N. Y. It is one of the defenses of the northern entrance to New York Harbor. There are quarters for five companies of artillery.

FORT TRUM′BULL. A United States military post, established in 1839, and occupying a reservation of 13 acres on the south side of New London Harbor, Conn. In 1777 a small redoubt by this name, and another in 1812, occupied this site. The post-office and telegraph station is New London, Conn. The garrison in 1902 consisted of two companies of artillery.

FORTU'NA (Lat., from *fors*, chance, probably connected with *ferre*, to carry). In classical mythology, the goddess of chance, called by the Greeks Tyche. According to Hesiod, she was a daughter of Oceanus; according to Pindar, a sister of the Parcæ. She differed from Destiny or Fate, in so far that she worked without law, giving or taking away at her own good pleasure, and dispensing joy or sorrow indifferently. She had temples at Smyrna, Corinth, and Elis. In Italy she was extensively worshiped from a very early period and had many names such as *Patricia, Plebeia, Equestris, Virilis, Primigenia, Publica, Privata, Muliebris, Virginensis,* etc., indicating the extent and also the minuteness of her superintendence. Particular honors were paid to her at Antium and Præneste; in the temple of the former city two statues of her were even consulted as oracles. Greek poets and sculptors generally represented her with a rudder, as a symbol of her guiding power, and a cornucopia; or with a ball, or wheel, or wings, as a symbol of her mutability.

FORTUNATE ISLANDS. See CANARY ISLANDS.

FOR'TUNA'TUS. The chief figure of a popular tale, or rather collection of tales, centring about the fortunes and misadventures of Fortunatus and his sons with a wishing cap and an inexhaustible purse, which prove their possessor's ruin. Many of the materials are ancient, but the composition is German of about 1450. *Fortunatus* was first printed at Frankfort in 1509 (reprinted in Simrock's *Deutsche Volksbücher*, 1846), and often afterwards in German, French, Italian, Dutch, English, Danish, Swedish, Icelandic. It was dramatized by Hans Sachs (1553), and in English by Thomas Dekker (1600), whose *Old Fortunatus* was turned back into German in 1620. The best modernization of the story is by Tieck in *Phantasus* (1816). Uhland left an unfinished narrative poem on Fortunatus and the idea was used by Chamisso in his *Peter Schlemihl.*

FORTUNATUS, VENANTIUS HONORIUS CLEMENTIANUS (c.530-c.600). Bishop of Poitiers, and chief Latin poet of his time. He was born at Ceneda, near Treviso, and studied at Ravenna. After traveling through Germany and France he took up his residence at the Court of Sigbert, King of Austrasia, where he wrote an epithalamium to celebrate the King's marriage with Brunhilda. He again took up the wandering life, but finally settled at Poitiers, where the was brought into association with Radegunda, wife of Clotaire II., who was living there in retirement in a convent which she had founded, and also met Gregory of Tours and other eminent ecclesiastics. He became a priest, and in 599 was chosen Bishop of Poitiers. Fortunatus wrote hymns, epitaphs, poetical epistles, verses in honor of his patrons, and descriptions of events in his life. He also wrote a life of Saint Martin of Tours and several other lives of saints. His hymn, *Vexilla regis prodeunt* ('The royal banners forward go'), is well known in the English translation by J. M. Neale. His works are in Migne, *Patrol. Lat.*, lxxxviii.; the best edition is by Leo and Krusch (Berlin, 1881-85). For his life consult: Leroux (Paris, 1885) and Nisard (Paris, 1880).

FORTUNE. A poem attributed by John Shirley to Chaucer. It first appeared in a set of poems brought together by the latter, the manuscripts of which are now in the Harleian Collection in the British Museum. The sources of the poem were partly Boëthius and partly the *Roman de la Rose.* It is described in the subtitle as "The Face of the World as it really is, not painted."

FORTUNE. A painting by Guido Reni, representing the Goddess of Fortune undraped, moving over a globe, and scattering money from a purse, while a cupid clings to her flowing hair and scarf. The painting is in the Accademia di San Luca, Rome.

FORTUNE, THE. A play-house which once stood near Blackfriars Bridge, London, close upon the site of the ancient Monastery of the Black Friars. It was first erected in 1599 by Philip Henslowe and Edward Alleyne, and occupied by the Lord Admiral's Company. It was originally of wood, was burned down in 1621, was rebuilt in brick, and was torn down by the Puritans in 1649.

FORTUNE, TEMPLE OF. One of the most ancient extant temples of Rome, and one of the best preserved, in the Forum Boarium, near the Æmilian Bridge. It was erected by Servius Tullius, and was rebuilt in the third century B.C. In the ninth century A.D. the spaces between the columns were walled up and the edifice became the Church of Santa Maria Epiziaca. The temple is remarkable for its pure Ionic architecture, and for the absence of marble in its construction. The exterior was covered with painted stucco. It contained a wooden statue, draped in a toga, which Pliny says lasted until the time of Tiberius. The popular name of the temple, Fortuna Virilis, is probably due to a mistranslation of its original title, Templum Fortis Fortunæ, in which Fortis was the genitive of *fors*, not of the adjective *fortis.*

FOR'TUNE, ROBERT (1813-80). An English botanist and traveler. After receiving a common school education he was employed in the Edinburgh Botanical Gardens, and at the conclusion of the Chinese War in 1842 he was sent to collect plants in northern China by the Royal Horticultural Society. His second journey to China in 1848, in the interests of the East India Company, like the first, gave to Europe many of the beautiful flowers of the Far East, and also resulted in the introduction of the tea shrub into India, where formidable competition with China in the production of tea immediately began. A third expedition included Formosa and Japan; and in 1857 Fortune again visited China to collect seeds of the tea shrub for the United States Patent Office. His published works include: *Three Years' Wanderings in the Northern Provinces of China* (1847); *Report upon the Tea Plantations in the Northwest Provinces* (1851); *A Journey to the Tea Countries of China* (1852); *Two Visits to the Tea Countries of China* (1853); *A Residence Among the Chinese* (1857); *Yeddo and Peking: A Narrative of a Journey to the Capitals of Japan and China* (1863).

FORTUNES OF MOLL FLAN'DERS, THE. A novel by Defoe (1722), the story of a harlot, thief, and convict, who finally reforms.

FORTUNES OF NIGEL, The. An historical novel by Walter Scott (1822). The scene is laid in London, and gives a vivid sketch of life in that city in the early years of the seventeenth century.

FORTUNE-TELLING. The telling of fortunes, whether by the arts of astrology, palmistry, or other forms of divination, was not an offense at the common law. But by the English Vagrancy Act of 1824 (5 George IV., c. 83) any person who pretends to tell fortunes or practice palmistry is liable to summary punishment by imprisonment as a rogue and a vagabond. Modern statutes in this country generally class those 'pretending to tell fortunes' as disorderly persons, and provide for their arrest and summary examination.

FORTU′NIO. The daughter of an octogenarian lord, who in disguise goes as her father's substitute when he is summoned for military service. With the aid of resources granted her by a fairy, she accomplishes many wonderful feats. The character appears in many fairy tales, ancient and modern.

FORTUNY Y CARBO, fôr-tōō′nė ē kär′bȯ, (1839-74). A Spanish painter and etcher. He was born at Réus, in Catalonia, June 11, 1839. He studied at the academy at Barcelona, under Claudio Lorenzalez, and received inspiration from lithographs of Gavarni. Afterwards he turned for his motives directly to nature. In 1856 he won a school prize, which enabled him to study at Rome. During the Spanish war against Morocco (1859-60), he was on the staff of General Prim, and was completely absorbed in sketching those Oriental scenes which appealed most strongly to his nature. With a view of copying the Spanish masters he went, in 1865, to Madrid, where he fell somewhat under the influence of Goya. There he made the acquaintance of Madrazo, whose daughter he married. In 1866 he visited Paris and received from the art dealer Goupil commissions which placed him above want, and soon after he settled in Rome. Henceforth he devoted himself to kaleidoscopic pictures of the Rococo period, which became his special province. His studio in Rome was a salon in which men of letters, artists, and many brilliant members of the social world were wont to congregate. He was forced by ill health to leave Rome for a while, but in 1874 returned to that city, suffered a relapse, and died October 21st of that year. His canvases were usually small in dimensions, but filled with multitudinous details painted with great freedom, skill, and vivacity of colors. He was very successful in dazzling sunlight effects. The city hall of Barcelona contains several of his paintings, notably the "Battle of Tetuan," considered one of his finest works, although unfortunately not finished. The sketch for this is in the Museo de Arte Moderno at Madrid, which also contains "Queen-Regent Maria Christina and Her Daughter Inspiring the Government Troops."

His work is to-day the dominating influence in Spanish art, in so far as it is individual, and has influenced the French school as well. Of his Oriental subjects, the best-known are the "Praying Arab," "Fantasy of Morocco" (1866), "Tribunal of a Cadi," and, especially, the "Snake Charmers," which he duplicated. His most celebrated Rococo picture is the "Spanish Marriage" ("La Vicaria," 1869), containing portraits of the painter Regnault (q.v.), Madame Fortuny, and other friends. Others are the "Trial of the Model," the "Poet," the "Rehearsal," the "China Vase." There is a large number of his works in America, both in public and private possession. Among these are three good examples: "An Ecclesiastic," "Don Quixote," and the "Mendicant," in the Waters Collection, Baltimore, and a portrait of a "Lady in Black," in the Metropolitan Museum, New York. Others of his most widely admired creations are "Hindoo Snake-Charmers," in the Walters Collection, Baltimore; "Wedding in the Vicaria at Madrid," "The Butterfly," and "Academicians Choosing a Model." One of his Oriental subjects, "Camels at Rest," is in the Metropolitan Museum, New York.

Fortuny was also an aquarellist of note, and a brilliant etcher, his works resembling those of Goya. Like him, he uses as a background the aquatint, and the outlines of his figures are drawn with light and spirited strokes. Some of his chief etchings are the "Dead Arab," the "Shepherd," the "Reader," the "Pensioner," the "Anchorite," the "Arab Mourning." Consult the biographies of Fortuny by Davillier (Paris, 1875) and Yriarte, in *Les artistes célèbres* (ib., 1885). See also the *Fortuny Album*, published by Goupil (ib., 1889); Bell, *Representative Painters of the Nineteenth Century* (New York, 1899); Muther, *History of Modern Painting*, vol. iii. (London, 1896).

FORT WADS′WORTH. A United States military post, established in 1827, and occupying a reservation of 221 acres on Staten Island, N. Y., commanding 'the Narrows.' The post-office is Rosebank, N. Y., while the telegraph station is Quarantine, Clifton, S. I. It was named for Gen. J. S. Wadsworth, who was killed in the battle of the Wilderness (1864).

FORT WALLA WALLA, wŏl′lȧ wŏl′lȧ. A United States military post, established in 1857. and occupying a reservation of 612 acres, one mile from Walla Walla, Wash., which is the post-office, telegraph, and railroad station. Its garrison consists of two companies of field artillery.

FORT WAR′REN. A United States military post, established in 1837, and occupying a reservation 28 acres in extent on Georges Island, 7¼ miles southeast of Boston, Mass. The post was first occupied in 1861, and during the Civil War was used as a military prison. The post-office and telegraph station is Boston, Mass. The garrison comprises two companies of artillery.

FORT WASH′INGTON, An important military post during the American Revolution, occupying the highest part of Manhattan Island, and covering the ground overlooking the Hudson between the present 181st and 182d Streets, New York. It was surrendered to the English under Sir William Howe on November 16, 1776. After the battle of White Plains (q.v.), Washington crossed over to New Jersey, but against his better judgment, left a considerable force under Colonel Magaw in Fort Washington. Howe invested the fort on November 15th, and commanded the garrison to surrender on pain of being put to the sword. Magaw replied that he would defend the place to the last extremity. The next day the British attacked in four divisions, led respectively by General Knyphausen and General Matthews (supported by Lord Cornwallis), Lieutenant-Colonel Sterling and Lord Percy. Soon after daybreak the cannonading began, and it continued with great fury on each side until noon. Knyphausen's Hessians then advanced in two columns, one of which, under General Rahl, ascending circuitously to the summit of the hill, penetrated Magaw's advanced works, while the other ascended the hill in a direct line, suffering much on the way from the well-directed fire of Colonel Rawling's riflemen. The second division made good their landing, forced the opposing Americans from their sheltering rocks and trees up a steep and rugged hill; while the third, landing under a heavy fire, succeeded, after a stubborn fight, in carrying an advanced redoubt. Percy's division, with conspicuous gallantry, carried other advanced works. On a second summons from Howe, Magaw, seeing the uselessness of further resistance, surrendered the fort, his troops (2600 in number) becoming prisoners of war. The American loss in killed and wounded was 130; the British, 454. The English had been materially assisted by the treason of one of Magaw's officers, William Demont, who, on November 2d, had deserted, and furnished Howe with detailed plans of the American works. The loss of the fort caused great consternation throughout the United States, and has been regarded as, in some respects, one of the greatest military misfortunes of the Americans during the war, the garrison representing the flower of Washington's army. Consult: De Lancey, *The Capture of Fort Washington, the Result of Treason* (New York, 1877); Dawson, *Battles of the United States* (New York, 1858); and Carrington, *Battles of the American Revolution* (New York, 1876).

FORT WASHINGTON. A United States military post, established in 1815, and comprising a reservation of 334 acres on the left bank of the Potomac River, 14½ miles below Washington, D. C. The garrison consists of three companies of coast artillery.

FORT WAYNE. A United States military post, established in 1842, and containing a reservation of 63 acres on the Detroit River, near the city of Detroit, which is the post-office and telegraph station. There are quarters for a battalion of infantry.

FORT WAYNE. A city and railroad centre, the county-seat of Allen County, Ind., 150 miles east by south of Chicago, Ill., at the junction of the Saint Joseph's and Saint Mary's rivers, which here unite in the Maumee, and on the Pittsburg, Fort Wayne and Chicago, the Lake Shore and Michigan Southern, the Grand Rapids and Indiana, the New York, Chicago and Saint Louis, the Wabash, the Lake Erie and Western, and the Cincinnati, Hamilton and Dayton railroads (Map: Indiana, D 1). It occupies an area of nearly 10 square miles on a plateau at an elevation of 775 feet, and has a United States Government building, a court-house that cost over $1,000,000, Saint Joseph's and Hope hospitals, Indiana School for Feeble-Minded Youth, orphan asylums, a public-library building, for the erection of which Andrew Carnegie gave $75,000, three public parks, and monuments to Anthony Wayne and Henry W. Lawton. It is also the seat of Concordia College (Lutheran), opened in 1839. The city is in an agricultural district and has important manufacturing interests. The industrial plants include shops of the Pennsylvania and the Wabash railroads, foundries and machine-shops, wheel-works, flouring-mills, electric-light works, knitting-mills, oil-tank works, packing houses, shirt and waist factories, etc.

Fort Wayne is governed by a mayor, who holds office for four years, and a unicameral council. Of the municipal officials, the boards of health, public works, and public safety are appointed by the mayor and confirmed by the council. The annual income of the city, including revenues of water-works, amounts to about $650,000, expenditures to $475,000, the principal items of expense being $30,000 for the police department (including amounts for police courts, jails, etc.), $50,000 for the fire department, and $100,000 for schools. The water-works, which are owned by the city, are operated at a yearly cost of about $40,000. Fort Wayne is built on the site of the principal village of the Miami Indians and near the site of the old French Fort Miami. In October, 1790, General Harmar burned the village. In 1794 Gen. Anthony Wayne built a fort here which, in September of 1812, was closely besieged by the Indians. A village gradually grew up and was chartered as a city in 1839, though growth of the place was very slow until after the completion of the Wabash and Erie Canal in 1840, and of several railroads between 1850 and 1860. Population, in 1850, 4282; in 1870, 17,718; in 1890, 35,393; in 1900, 45,115.

FORT WILLIAM. A town in Algoma District, Ontario, Canada, on the Kaministiquia River, near Lake Superior (Map: Ontario, L 8). It is an important landing-place for lake steamboats and the terminal station of the east division of the Canadian Pacific Railroad. It has grain-elevators in connection with an important shipping trade, and is a favorite summer resort for boating, fishing, and shooting. It is picturesquely situated at the foot of McKay Mountain, and was founded by the Hudson Bay Company in 1801; their old fort is now a power-house. The United States is represented by a consular agent. Population, in 1891, 3000; in 1901, 3633.

FORT WILLIAM. See CALCUTTA.

FORT WILLIAM HENRY. A fort erected in 1755 by Sir William Johnson (q.v.) on the site of the present Caldwell, N. Y., at the head of Lake George. During the early part of the French and Indian War it was an important strategic position, and was the starting-point for many minor expeditions against the French and Indians. Rigaud, at the head of a considerable French force, made a half-hearted and unsuccessful attack upon it in the spring of 1757 (March 18-23), and later in the year Montcalm marched against it at the head of a force of about 8000, including 2000 Indians. On August 2d he demanded the surrender of the fort, then garrisoned by about 2200 men, and on the refusal of Colonel Munro, the commanding officer, began a vigorous attack. Although Colonel Webb was stationed at Fort Edward, only fifteen miles away, with an English and colonial force of 1600, Colonel Munro was not reinforced, and on the 9th was compelled to surrender, Montcalm agreeing that the garrison should march out with the honors of war, and should be escorted to Fort Edward by a detachment of French regulars. Early on the 10th the survivors began their march, but were soon set upon by the Indians, and a general massacre ensued, an unknown number of the troops being killed outright, and many more being carried into captivity. Though this attack was not instigated by the French, contemporary evidence seems to show that no earnest effort was made by them to force the Indians to observe the treaty stipulations. Cooper used this incident in his *Last of the Mohicans.* Consult Parkman, *Montcalm and Wolfe* (Boston, 1884).

FORT WORTH. A city and the county-seat of Tarrant County, Texas, 30 miles west of Dallas; on Trinity River, and on the Gulf, Colorado and Santa Fé, the Texas and Pacific, the Chicago, Rock Island and Pacific, the Fort Worth and Denver, the Fort Worth and Rio Grande, and other railroads (Map: Texas, F 3). It is the seat of Fort Worth University (Methodist Episcopal) founded in 1881, Polytechnic College (Methodist Episcopal, South) opened in 1891, and the Fort Worth Medical College. Among the finest structures in the city are the Carnegie Public Library, railroad depots, post-office, city hall, and county court-house. Fort Worth has an annual trade valued at $30,000,000; it is the centre of a vast stock-raising country, and is an important cotton market. The industrial establishments include stock-yards, packing houses, grain-elevators, flour-mills, tanneries, breweries, railroad repair-shops, foundries and machine-shops, cotton and oil mills, etc. Settled in 1849, Fort Worth was incorporated in 1872. The government is administered under a charter of 1900, by a mayor elected biennially, and a council which controls the appointments to most of the subordinate municipal offices. The city owns and operates its water-works and electric-light plant. Population, in 1880, 6663; in 1890, 23,076; in 1900, 26,688.

FORT YELLOWSTONE. A United States military post, established in 1886, and formerly Camp Sheridan (1874). The reservation comprises 28 acres on Beaver Creek, and is eight miles from Cinnabar on the Northern Pacific Railroad, within the limits of Yellowstone National Park. The post-office and telegraph station (June to October) is Mammoth Hot Springs, near the post; and telegraph station (October to May) Cinnabar, Mont. The garrison is one company of cavalry, and has charge of the Yellowstone National Park.

FORTY-NINERS. A name popularly applied to the throng of fortune-seekers who emigrated to California in the years immediately following the discovery of gold there in 1848, especially to those who went during the period of greatest excitement in 1849. They were also called 'Argonauts.' They came, some by land and some by sea, from all parts of the world, and had among them representatives of almost every nationality, of every color, and of every social stratum. Those who came by sea embarked, for the most part, from ports in the Eastern States, some making the long and dangerous voyage around Cape Horn, and others proceeding to Chagres (q.v.), and thence across the Isthmus to Panama, where they again embarked on any vessel obtainable. The chief carriers were the three side-wheelers, the *California*, the *Oregon*, and the *Panama*, of the Pacific Mail Steamship Company, which frequently transported more than three or four times the number of passengers for which they were designed. Besides these, nondescript vessels, of every size and kind, were commissioned for the service, and were likewise greatly overcrowded, while many reckless adventurers, unable to force their way aboard, left for their destination in clumsy Indian dug-outs. Much as passengers by the sea suffered, however, overland travelers suffered even more. The majority of these gathered from May to June of each year at Independence or Saint Joseph, Mo., at that time on the frontiers of civilization, and then proceeded to Sacramento in long caravans, continually harassed on the way by the Indians, and forced to suffer terribly from starvation, exposure, and fatigue. The first emigrant train reached Sacramento in August, 1849, and others followed in quick succession. By the end of 1849 it is estimated that 42,000 emigrants had arrived by land, and 30,000 by sea. Consult: Bancroft, *History of the Pacific States*, vol. xviii. (San Francisco, 1888), and ib., *California Inter Pocula* (San Francisco, 1888); Bayard Taylor, *El Dorado* (New York, 1862); Stillman, *Seeking the Golden Fleece* (San Francisco, 1877); and Bret Harte, *Tales of the Argonauts* (Boston, 1875).

FORTY THIEVES, The. A band of robbers, in the tale of "Ali Baba," in the ordinary translations of the *Thousand and One Nights*, although not found in the best Arabic manuscripts. They dwelt in a cave in the forest, the door of which opened only in response to the words 'Open, sesame.'

FORUM (Lat., market-place; connected with *foris*, door). The term applied by the Romans to the large open space in the central part of any city, which was the common resort of the people for business and pleasure. It was the political centre, where the magistrates and people met, and where elections were held; here were the administrative and civic buildings or inclosures, such as the *comitium*, with its tribunals and rostra for the large assembly; the *curia* or senate house, temples, treasuries, and basilicas, or law courts. At each end of the road or roads crossing the fora were often archways, or *Jani*, used as resorts for merchants and scribes. The other buildings bounded the forum on different sides, and between them were shops or *tabernæ* belonging to the different trades.

Historic Evolution. In the early days of the Royal and Republican ages, there appears to have been but a single forum in each city, serving not only for political, legal, and mercantile purposes, but also for the popular games and amusements — the theatrical shows, wild-beast contests, gladiatorial fights, and races. The old Roman Forum and all those modeled upon it, like that of Sinuessa, were of this type. The next stage was the distinction into two fora, one devoted to law, administration, and politics, and the other to the sale of commodities. This was due, perhaps, to the influence of Greece, where there were often two agoras of this description— as at Athens. The Greek agoras were microcosms of the city, filled with tents, shops, and benches, surrounded by special buildings, and with bazaars in the connecting streets; here laborers were hired, slaves bought, and all business transacted. Until a few decades ago the plan and buildings of such Greek squares were hardly known at all, except for Pausanias's description of those at Athens, Megalopolis, Corinth, Messene, Elatea, Sparta, and Elis; but a number have recently been excavated or investigated with great success, not only in Greece, but in Asia Minor, especially at Priene, Miletus, Side, Termessus, Aphrodisias, Antiphellus, Pessinus, and Cnidus. It is not possible to compare closely these Greek agoras with the Roman fora. The differences are due, not merely to the very different schemes of administration, but to the great importance given to law by the Romans, which finally made of the basilicas the great factor in the administrative fora.

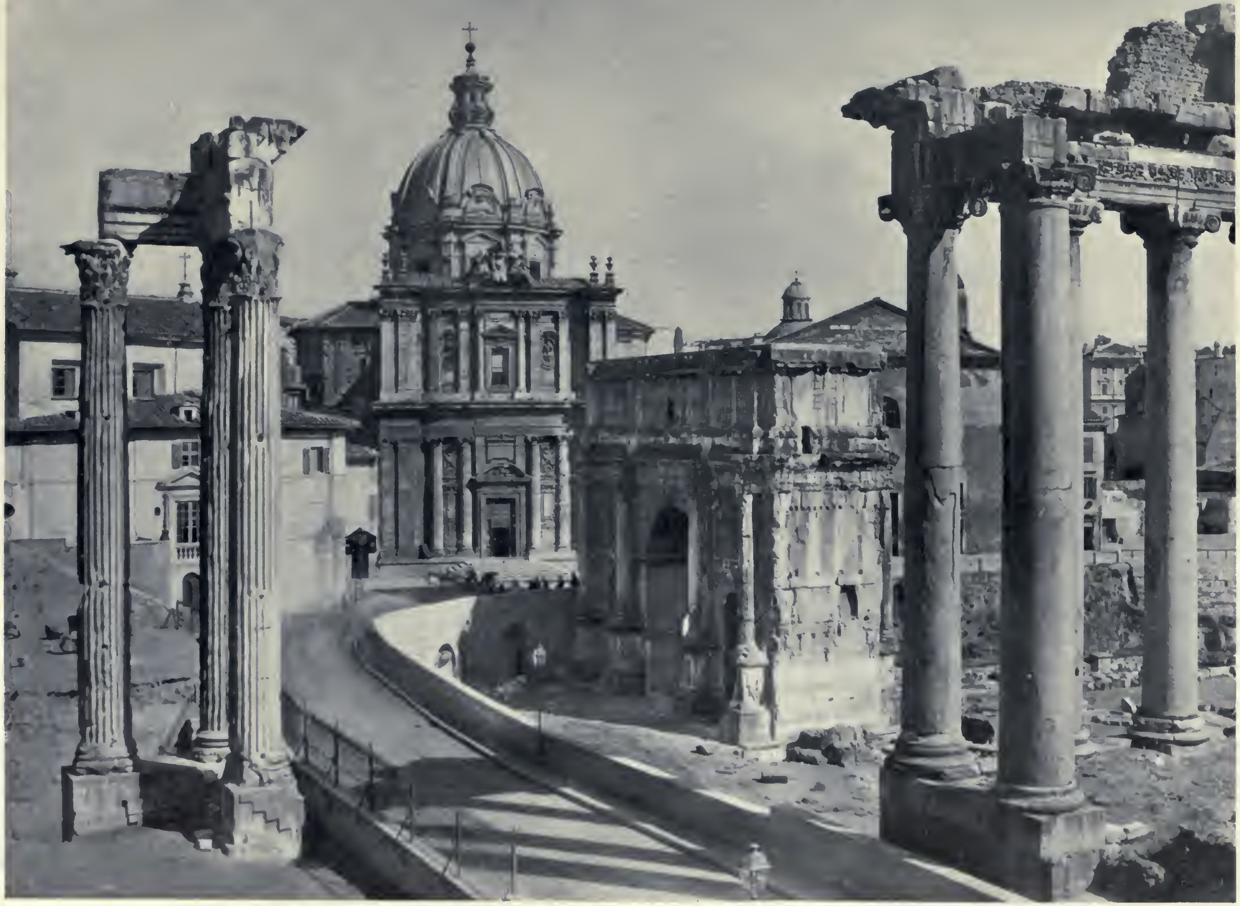
THE DIFFERENT FORA. The third stage, however, in the differentiation of the fora, had been reached before the basilicas (q.v.) had attained this importance; it was through the establishment of a separate forum for the sale of each important commodity. There were one or more cattle or *meat* markets (*forum boarium, forum saurium, forum pecuarium*), for horned cattle, pigs, and sheep; a *fish*-market (*forum piscarium*); a *wine*-market (*forum vinarium*); a *vegetable*-market (*forum olitorium*); a *grain*-market (*forum pistorium*). Less space was required for the trades, such as goldsmiths, saddlers, glaziers, money-changers, dry-goods merchants, blacksmiths, tinsmiths, etc., and they occupied shops around these separate squares, or on streets leading from them. There were evidently sometimes covered markets, such as cloth-markets, like that of Pompeii. The city theatre often adjoined the forum, as at Ostia and Timgad; so did the circus and amphitheatre in many cases. The temples of the forum often served more than a religious purpose; in Rome the Temple of Concord served for meetings of the Senate, and that of Saturn was at one time the State Treasury, and even the public archives until the erection of the Tabularium (q.v.). In many Imperial Roman cities there was a *Capitolium* in connection with the forum, a triple temple in imitation of the Temple of Jupiter (Juno and Minerva), as at Suffetula. Of the fora outside of Italy, those of the cities of North Africa are the most interesting and direct imitations, and their ruins are numerous and untouched. The most important is at Thamugadi (Timgad), like so many other African cities, a military colony. It had its two triumphal arches at each end of its main road, its temples, curia, scholæ of the corporations, tribunal and rostra, basilica and colonnades inclosing the square.

The fora at Pompeii are also well preserved. They were: The *forum triangulare* to the south, with the Doric Greek temple, a colonnade on two sides, and an Ionic portico at the entrance; the principal forum, about 450 feet from north to south, with the Temple of Jupiter, flanked by a memorial arch on each side, formerly the main entrance, on the north, with the three *curiæ* or tribunals, occupying the south end, with the Basilica and the Temple of Apollo on the west, and the *macellum* or market, the 'Senaculum,' the Temple of the Genius of Augustus, and the Schola or corporation building on the east side, and near by the building of the Eumachia, or cloth-market.

The open spaces in all the fora were so filled with honorary statues even as early as the Republican period, as well as with altars, arches, wells, memorial columns, etc., that it was necessary at times in the Roman forum to order a wholesale removal of them. The fora of Rome were naturally in a class by themselves, although in the fourth century A.D. those of the new Imperial capital, Constantinople, were made almost to rival them in number and wealth of artistic decoration by the Emperors from Constantine to Honorius.

THE FORUM ROMANUM. The original Roman Forum (*Forum Romanum Magnum*) occupied the lowlands between the Palatine, Capitoline, and Quirinal hills, and served as political and commercial common ground for the separate tribes inhabiting these different hills, as well as those on the Cœlian and Esquiline, before the closer union under the Tarquins when Rome became one city. Then the Forum took a more regular and monumental shape, and was underdrained and surrounded by shops. The temples of Saturn (B.C. 497), of the Dioscuri (B.C. 484), and of Concord (B.C. 367) added substantially to its beauty, but it was not until quite late (B.C. 184) that the first court-house, the Basilica Porcia, was built, to be followed by the Fulvia (Æmilia), Sempronia, and Opimia, giving to the Forum the characteristic colonnaded effect that was imitated in other cities. This crowding of the open space with buildings and honorary monuments, and the increasing importance of the political aspect of the Forum (being the place of meeting of people and Senate), as well as its legal aspect, led to the relegation to a separate market of the malodorous fish-mongers' stalls (*forum piscatorium*), and this example was followed for the other venders, as explained above. Even this failed to give sufficient room for the rapidly expanding political-judicial life of the city, and in B.C. 54 a new era was commenced by the construction of the Æmilian basilica, in pursuance of a scheme carried forward by Julius Cæsar, who began the addition of the special fora.

IMPERIAL FORA. The Forum Julium was followed by Augustus with his Forum Augustum or Forum Martis, by Vespasian with his Forum Pacis, by Domitian and Nerva with the Forum Transitorium, and finally by Trajan with his magnificent Forum Traiani, the most superb architectural group in Rome—all communicating with the Forum Romanum in a continuous line to the north and east of it. Of these, the Julian Forum was in the form of a sacred inclosure, around a temple of Venus Genetrix, Cæsar's patroness; the Augustan, dedicated to Mars, was an inclosure ending in the Temple of Mars Ultor, flanked by two triumphal arches, and intended to be an heroum, filled with a gallery of statues of great Romans who had extended the boundaries of Roman power; the Forum of Nerva was dedicated to Minerva, and besides her temple contained the main thoroughfare of this part of the city, which gave it the name Transitorium. Finally, the Forum of Trajan had its own special basilica (*Basilica Ulpia*), like the great Forum: it was entered through a colossal triumphal arch leading to the open square of the forum surrounded by a double colonnade, with the Emperor's equestrian statue in the centre, and flanked by a large hemicycle on each side. Then came the Basilica Ulpia, also with two end hemicycles, and a double two-storied colonnade, the double Library with the Memorial Column in the intermediate area, and, finally, the Temple of



THE ROMAN FORUM

SHOWING THE COLUMNS OF THE TEMPLE OF SATURN (RIGHT), THE ARCH OF SEPTIMIUS SEVERUS, THE CHURCH OF SS. MARTINA E LUCA, AND THE COLUMNS OF THE TEMPLE OF VESPASIAN.

Trajan, erected by Hadrian. The importance of this forum was increased by the fact that it took the place of the hill connecting the Capitoline and Quirinal, and so for the first time established an adequate connection between the two sections of the city on either side of the Capitoline Hill. As for the Roman Forum itself, its decoration was continued to the latest days of the Empire, many honorary statues being set up and buildings repaired during the fourth century. Its appearance at that time was about as follows: Backing against the Capitol were the temples of Concord, of Vespasian, and the Dii Consentes, while the Temple of Saturn occupied the space between the ascent to the Capitol and the Vicus Jugarius, where the Arch of Tiberius also stood, across the forum facing the Arch of Septimius Severus, with the Rostra between them. Beyond the Arch of Severus were the political buildings, the Curia or Senate-house, and its annexes, on the Comitium, the other buildings on the north side being the Temple of Janus and the Basilica Æmilia. On the opposite (south) side was the great Basilica Julia, occupying the space between the Vicus Jugarius and the Vicus Tuscus, and the Temple of Castor (Dioscuri)—one of the most exquisite works of Roman architecture. The centre of the open space is here occupied by the Temple of Julius, flanked by a triumphal arch of Augustus. Continuing eastward we reach the primitive religious centre of this region, the Regia and the Shrine of Vesta with its atrium opposite, which are the Temple of Antoninus and Faustina and the Templum Urbis. Here anciently stood the Arch of the Fabii, originally the entrance to the Via Sacra.

Later History. The topography and monuments of the Forum appear to have suffered but slight damage from the barbarian invasions of the fifth century, and it was not until the ninth century that its ruin was noticeable, accompanied by a rise in its level. It was the fire of 1084, when Guiscard captured the city, which gave the old buildings their death blow, and buried them partly out of sight, the more conspicuous being occupied as feudal fortresses, and the level spaces turned into gardens. The Renaissance combined, with its antiquarian curiosity, a destructive vandalism which was more fatal to the Forum and the monuments surrounding it than any previous disasters, especially under Paul III. (1534-49). The area became waste land, in which stood a few melancholy columns. It was called the Campo Vaccino. The destruction stopped only at the beginning of the nineteenth century under Pius VII. and his antiquarian Fea, and excavations have been carried on almost continuously ever since then. It is to be regretted that they have not been conducted in an absolutely scientific manner until those of recent years under Boni (whose admirable methods deserve high praise), and resulted until then in the destruction of many landmarks. Much remains to be done, especially in the region of the Basilica Æmilia and in the lower strata of the Republican and Royal periods.

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FORUM. In law, a court, or a place of jurisdiction. It is used by Blackstone in the first sense, when he speaks of leaving a person to his "common remedy in *foro contentionis*"—in a court of litigation, that is in an ordinary court of justice. Judges sometimes refer to a domestic court as *forum domesticum*. The term is used in a similar sense when an advocate is described as eminent or successful in the forum. It is more frequently employed in the second sense, as a place of jurisdiction. It bears this signification in Kent's commentaries. "In respect to remedies," writes the Chancellor, "there are properly speaking three places of jurisdiction: (1) The place of domicile of the defendant, commonly called the *forum domicilii;* (2) the place where the thing in controversy is situate, commonly called the *forum rei sitæ;* (3) the place where the contract is made, or the act done, commonly called the *forum rei gestæ* or the *forum contractus.*" When it is said that a question is to be determined by the *lex fori*, it is meant that the decision is to be in accordance with the law of the jurisdiction within which the action is brought. (See Conflict of Laws.) The employment of the term in these and similar significations is due to the fact that Roman courts of justice were held in or near the Forum. Consult Forsyth, *Hortensius the Advocate*, ch. iii. (Jersey City, 1881).

FO'RUM AP'PII. A town on the famous Appian Way (q.v.); the modern Foro Appio, 43 Roman miles from Rome. Here a canal began which ran southward parallel with the Appian Way to within a short distance of Terracina. Horace (*Satires* i., 2 sqq.) has an amusing description of the place as "abounding in boatmen and wretched inns." Here travelers might, if they preferred, change from the road to the canal-boat. This was Horace's choice, much to his discomfort. At this place, Paul, on his journey to Rome, being met by brethren of the Roman Church, 'thanked God and took courage' (Acts xxviii. 15).

FORUM BOA'RIUM. The ancient cattle-market of Rome, situated between the Velabrum and the Tiber; on its side stands the elegant circular Temple of Hercules (?), popularly called the Temple of Vesta.

FORUM JU'LIUM, or **FORUM OF CÆSAR.** The first of the five Imperial fora at Rome. It was built by Cæsar from the spoils of the Gallic war, on ground to the northeast of the Forum Romanum, for which $4,000,000 was paid. It was surrounded by arcades and contained the magnificent temple of Venus Genetrix. Nothing now remains of its buildings but some half-buried arches.

FORUM OF AUGUSTUS. See AUGUSTUS, FORUM OF.

FORUM OF NERVA. See NERVA, FORUM OF.

FORUM OF TRAJAN. See TRAJAN, FORUM OF.

FORUM OL'ITO'RIUM (Lat., vegetable market). The vegetable market of Rome, adjoining the Forum Boarium. The space contained several temples, of which some remains are preserved.

FORUM PA'CIS (Lat., Forum of Peace), or **FORUM OF VESPA'SIAN.** The third of the Imperial fora at Rome, built to inclose Vespasian's Temple of Peace, called by Pliny one of the three most magnificent buildings in Rome. In it were dedicated the spoils taken from Jerusalem. There are no remains of the temple. This forum was separated from the Forum of Augustus by a wide street leading from the Subura to the Forum Romanum. This strip later became the Forum Transitorium of Nerva.

FORUM ROMA'NUM. See FORUM.

FORUM TRAN'SITO'RIUM. See NERVA, FORUM OF.

FOR'WARD, WALTER (1786-1852). An American lawyer and Cabinet officer, born in Hartford County, Conn. In 1803 he removed to Pittsburg, Pa., where for some time he was an editor of the Democratic newspaper, the *Tree of Liberty*. He then studied law, was admitted to the bar in 1806, and for some time combined both law and journalism. In 1822 he was elected to Congress as a Democrat, to fill a vacancy, and in 1823 took his seat for a full term, to serve until 1825. During this time he became associated with the followers of John Quincy Adams, whom he supported for the Presidency. Thenceforth his affiliations were with the Whigs. He was a leading member of the Protectionist Convention at Harrisburg in 1827, was active in the Pennsylvania Constitutional Convention in 1837, and in 1841 was appointed by President Harrison First Comptroller of the Treasury. After the death of Harrison and the subsequent resignation of his Cabinet, Forward was appointed by President Tyler, in September, 1841, as Secretary of the Treasury; but as Tyler broke away more and more from the Whigs, his position became more difficult, and finally, in March, 1843, he resigned. From 1843 to 1849 he practiced his profession at Pittsburg; from 1849 to 1851, by appointment of President Taylor, was chargé d'affaires at Copenhagen, Denmark, and from 1851 to his death was president judge of the Allegheny County District Court.

FORWARDING. The business of receiving and transmitting goods. The forwarding merchant assumes the expense of transportation, and receives compensation from the owners. Such a person is not deemed a common carrier, but is merely a warehouseman or agent, and is required only to use ordinary diligence in sending the property by responsible persons, and to obey the instructions of his principal. Forwarding merchants have in the United States been superseded largely by express companies. Common carriers often act as forwarders of goods from points on their own line to other places. A person who holds himself out as a public forwarder is under a legal duty to receive and forward all goods tendered to him by any person for a reasonable compensation, unless he can show a valid excuse for his refusal or failure so to do. See CARRIER, COMMON.

FOSCARI, fôs'kå-rê, FRANCESCO (1372-1457). Doge of Venice from 1423 to 1457. Previous to his election he had acquired considerable reputation as the guardian of the young Marquis of Mantua, and as one of the procurators of San Marco. He was always an advocate of an aggressive policy on the Italian mainland, for the purposes of territorial aggrandizement, and he was elected to the Dogate as an exponent of such a policy. He soon entered upon a course of conquest, which continued, with intervals of peace, for nearly thirty years, and which, in spite of many defeats, resulted in the reduction of a large part of northern Italy under Venetian rule. In 1426-27, in league with Florence, Naples, Savoy, and many minor principalities, he carried on a conflict with the Visconti of Milan. As a result, Venice acquired the towns of Bergamo, Cremona, and Brescia. War broke out again in 1431; the Venetian forces suffered defeat; but in the treaty of peace the territories of the Republic were nevertheless extended to the Adda. Two years later hostilities were recommenced; this time Venice, Florence, Genoa, and the Pope were arrayed against Milan, Mantua, and Naples, and by the peace signed in 1441 Venice gained possession of Peschiera and other places. Hostilities were finally terminated by the Peace of Lodi, in 1454. In spite of his uniform success in Italy, Foscari was forced to meet bitter opposition at home. This was based mainly on the fact that, owing to the Italian wars, the influence of Venice had suffered greatly at the hands of the Turks in Greece and in the Grecian Archipelago. This opposition took the form of a cruel persecution of Foscari's youngest son, Giacopo, who, with his father, forms the subject of Byron's tragedy *The Two Foscari*. In 1444 Giacopo was denounced for having received bribes in order to use his influence in the disposal of State offices. He was tried by the Council of Ten and banished; but in 1447, on the Doge's petition, he was allowed to return, and he lived quietly at Venice for three years. In 1450 one of the Council of Ten was murdered, and suspicion fell upon Giacopo, who in the following year was tried, tortured, and banished to Candia, the Doge taking no part in the trial. There was great doubt about Giacopo's guilt, though he seems to have engaged in treasonable correspondence. He was again recalled, tried, and again banished. There was still so much uncertainty about his guilt that a movement to recall him had almost succeeded when his death was announced, in 1457. Foscari, worn out and broken-hearted, was soon after deposed illegally by the Council of Ten, through the machinations of his enemy, the Admiral Giacopo Loredano, who had been the chief instigator in the relentless persecution of the younger Foscari. He resisted at first, but yielded to force, and left the Doge's palace on October 24, 1457. He died on November 1st. Consult Brown, *Venice* (New York, 1893).

FOS'CO, Count. A corpulent villain in Wilkie Collins's *Woman in White.* He combines fiendish relentlessness in the pursuit of his designs with a gentle tenderness for pet canaries.

FOSCOLO, fôs'kô-lô, Ugo (1778-1827). An Italian writer, born at Zante, in the Ionian Isles, the son of a Venetian family then settled there. Originally called Niccolò, he early changed his name to Ugo. Part of his childhood was spent in Dalmatia with his father, a physician practicing at Spalato, and when this parent died he returned to Zante, whence, probably in 1793, he went to Venice. His education was continued in this city, and he made occasional visits to the University of Padua, but does not seem to have regularly matriculated there. With 1795 began his multitudinous love affairs (consult Chiarini, *Gli amori di Ugo Foscolo, etc.*, Bologna, 1892), an account of which could only bring out his inordinate vanity and fickleness. Fired with patriotic fervor, Foscolo served as an officer in armies of the several ephemeral Italian republics from 1796 on. To the period between 1799 and 1803 belong two of his best odes, those entitled "Luigia Pallavicini caduta da cavallo" and "All' amica risanata." He served in France, with the Italian division of the French Army, from 1804 to 1806, and spent some time at Boulogne-sur-Mer and at Valenciennes, where his natural daughter Floriana was borne to him by an English mother. Back in Italy in 1806, he was appointed to the chair of eloquence at the University of Pavia in 1808, and there he pronounced his inaugural discourse, "Dell' origine e dell' uffizio della letteratura," metaphysical in conception, but highly finished in form. He lost his post before long, when the chair of eloquence was abolished in all the Italian universities, and from that time on his life was marked by many vicissitudes and much suffering. A classical tragedy of his, the *Ajace*, was performed at Milan in 1811, and as it was supposed to contain some flings at Napoleon—formerly Foscolo's idol, but now his bane—the author was obliged to leave Milan. In 1813, when Napoleon's power declined, he returned to Milan, only to leave the place again when the Austrians regained control of it and his patriotic sentiments prevented him from taking the oath of allegiance to the foreigner. Self-exiled, he went to Switzerland, and then to England, where he was welcomed as a type of the fearless patriot. He lived at Kensington and in London, and in both places burdened himself with debts by his foolish lavishness. He was rescued from poverty and misery by his friend, Hudson Gurney, and died at Turnham Green. His remains were interred at Chiswick; but in 1871 the Italian Government had them transferred to Florence.

Beginning at an early date to write verses in both Italian and modern Greek, Foscolo rapidly approached excellence of composition in the former language, as is proved by the two odes mentioned above, and some exquisite sonnets produced between 1800 and 1803. *Tieste*, a youthful tragedy, was published at Venice in 1797, and was followed by the *Ajace* (1811), which was first published posthumously at Naples in 1828. Another tragedy, the *Ricciarda*, dealing with a mediæval subject, was performed at Bologna in 1813, and published at London in 1820. The influence of Alfieri is clear in all these dramas, of which the *Ajace* alone has decided merits. By 1807 Foscolo had written his masterpiece, *I Sepolcri*, a poem of 295 hendecasyllables in blank verse, which in magnificently lyrical passages extols burial monuments as incentives to virtue and good deeds, since they commemorate those of the dead. Some of the inspiration for this work came to Foscolo from other poets. Many commentaries have been written upon it, one of the best being that of Ferrari in his school edition of the *Poesie di Ugo Foscolo* (Florence, 1891). Of *Le Grazie*, addressed to the sculptor Canova and intended to be a poetical history of art, only a fragment remains, first published by Orlandini (Florence, 1848), and since in the excellent edition of the *Poesie di Ugo Foscolo* by Chiarini (Leghorn, 1882). A passing notice may be given to the poetical *Epistola a Vincenzo Monti* (1804-06), the hymn *Alla nave delle Muse* (1806), and his numerous revisions of Greek, Latin, and French poems—as, for example, his translation of parts of the *Iliad.*

Although the *Sepolcri* is the best work of Foscolo, he owes his greatest fame to his prose works, and especially to his *Ultime lettere di Jacopo Ortis* (1798), a novel produced under the influence of Goethe's *Werther*, and unfortunate in its attitude with regard to suicide. As instances of Foscolo's well-developed critical powers, we have the inaugural discourse given at Padua, and his "Illustrazioni," furnished to an edition of the *Opere di R. Montecuccoli* (Milan, 1807-09). His Italian translation of Sterne's *Sentimental Journey* was begun at Boulogne-sur-Mer. It was published under a pseudonym at Pisa in 1813, and republished in the *Hypercalypseos Didimi Clerici* (Zurich, 1815). In England he produced considerable prose. Thus, for an edition of Boccaccio's works (London, 1825) he wrote as a preface his *Discorso storico sul testo del Decamerone*, and for an edition of Dante's great poem he prepared an essay, *Sul testo della Commedia di Dante* (Brussels and London, 1842), which is a treatise of no little importance in the history of Dante studies. Foscolo also contributed articles to English magazines. Many of his letters are printed in the *Epistolaria*, prepared by Orlandini and Mayer for the edition of his works published at Florence (1850-62); others have been since edited by Tobler (Leipzig, 1871), and many more scholars.

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FOSS, Corporal. In George Colman's *The Poor Gentleman*, the disabled soldier, the servant of Lieutenant Worthington. The character is based on Corporal Trim, in Sterne's *Tristram Shandy.*

FOSS, CYRUS DAVID (1834—). An American clergyman of the Methodist Episcopal Church. He was born at Kingston, N. Y.; graduated at Wesleyan University in 1854, and entered the itinerant ministry of the Methodist Episcopal Church, in the New York Conference, in 1857. From 1857 to 1859 he was a pastor at Chester, Orange County, N. Y.; from 1859 to 1865 in Brooklyn, N. Y., and from 1865 to 1875 in New York, N. Y. He was president of Wesleyan University from 1875 to 1880, and in the latter year was elected a bishop. In 1878 he was delegate to the General Conference of the Methodist Episcopal Church South, held in Atlanta, Ga., and in 1886 to the British Wesleyan Conference, held in London, England. He made official tours of the missions of his Church in Europe (1886), in Mexico (1893), and in India and Malaysia (1897-98).

FOS'SA, or FOUS'SA (Malagasy). The largest carnivorous mammal of Madagascar, a slender, lithe creature, connecting the cats and civets and in structure partaking of both. It is about twice the size of a house cat, and has a very long, tapering tail, so that it measures fully five feet from tip of nose to end of tail. It is nearly uniformly pale brown in color, with the hair short and close and no spots. Each foot has five catlike toes, the claws of which are sharp, curved, and retractile; but the soles of the hind feet are entirely naked, and rest upon the ground in walking. The dentition is a mixture of forms characterizing both the cats and the civets, the teeth numbering thirty-six in all. A separate family has been proposed for this strange carnivore by several zoölogists; but it seems best to regard it as alone representing a group Cryptoproctinæ within the civet family (Viverridæ), under the name *Cryptoprocta ferox.* It seems to be confined to Madagascar, where it is not numerous; and although much dreaded by the natives, on account of its reputation for ferocity and ability to do harm, is rarely seen, since it is wholly nocturnal. It feeds upon small animals and birds, and occasionally invades poultry yards; but its general habits are little known.

FOS'SA MA'RIA'NA (Lat., trench of Marius). The canal made B.C. 102, by Marius, from the Rhône to the Gulf of Stomalimne, near the modern village of Foz (*Fossæ Marinæ*). It was constructed to avoid the difficult navigation at the mouths of the river, caused by the accumulations of sand by the several streams. It was about 16 miles long, and was later given to the inhabitants of Massilia (Marseilles), who derived large revenues from it.

FOSSANO, fôs-sä'nô. A city in North Italy, 1240 feet above the sea, on the left bank of the Stura, 40 miles south of Turin (Map: Italy, B 3). The name Fossano, derived from the Latin *fons sana,* indicates the presence of much-visited mineral springs. The city has promenades on the site of the old walls, a fourteenth-century cathedral, a seminary, a gymnasium, and an academy of science. It manufactures silk fabrics, gunpowder, leather, paper, and baskets. Fossano was purchased by the House of Savoy in 1340, was the residence in the sixteenth century of Philibert Emmanuel and several of his successors, and in 1796 and 1799 was the scene of battles between the French and the Austrians. Population, in 1881, of commune, 18,000; in 1901, 18,133.

FOSSANO, AMBROGIO. See BORGOGNONE.

FOSSIL (Fr. *fossile,* from Lat. *fossilis,* dug up, fossil, from *fodere,* to dig; connected with Corn. *bedh,* Welsh *bedd,* grave, OChurch Slav. *bosti,* Lith. *badyti,* to pierce). Any remains or trace of the form of animals or plants found buried by natural causes in deposits or rocks before the present era. The term was formerly applied to anything dug up out of the ground, and included minerals, prehistoric implements, etc. At the present day the word is used as an adjective in this latter sense, and also to designate anything pertaining to prehistoric times. Thus, we read of fossil salt, fossil rain-drops and mud-cracks, and fossil lakes, deserts, sea-beaches, and shores. The word petrifaction is often incorrectly employed as a synonym for fossil, although it properly designates only such organic remains as have been turned to stone, as described below. Fossils are the relics of the animals and plants that have lived upon the earth and in the waters of the earth during the long periods of its geological history, and study of their organization, occurrence, and relations to each other and to modern organisms constitutes the science of paleontology (q.v.). Fossils are naturally absent from all rocks of igneous and volcanic origin, and, on the other hand, they are present originally in nearly all rocks of sedimentary origin. From large masses of these latter they have been obliterated by chemical and physical changes, so that they are now seldom or sparingly found in metamorphic rocks. The processes by which organic remains have been preserved are grouped under the term fossilization. This includes entombment and the subsequent changes that have ensued. The place of entombment may be on land, in fresh water, or in the salt water of bays, seas, or oceans.

The degree of preservation of fossils varies greatly. In some few cases the flesh of animals has been preserved as if in an ice-box. Mammoth carcasses embedded in the frozen mud cliffs of Siberia for thousands of years had meat so fresh that it was eaten by the dogs of the exploring party. The most perfectly preserved fossils are undoubtedly those insects found in the Tertiary amber of the Baltic Provinces, where the form, structure, and colors are retained intact. Then we find shells preserved in the rocks with their original organic matter replaced by some mineral, usually silica, or perhaps barytes, pyrites, or even zinc blende. Such replacements rightly receive the name of 'petrifactions.' In other cases we find cavities in rocks, the sides of these retaining impressions of the outer and inner surfaces of shells which have been dissolved and destroyed by percolating waters. These 'molds' are sometimes filled with calcite, or quartz, or other mineral matter, and then we have 'casts' of the original organic forms. The study of these molds is puzzling to the beginner, because of the multiplication of forms so caused. A single shell like a limpet, if preserved in the rocks, may present four different aspects as a fossil—the outer and inner surfaces of the shell itself, and the molds of each of these. The mold of the outer surface may pull away such delicate spines as may ornament the shell, and for this reason molds should always be carefully collected and treated with acid, after which the impression of the original shell surface is often shown with the utmost fidelity to detail. Another class of fossils consists of the impressions or trails made by animals crawling over the bottom of the water or over the beach, and also of burrows or casts of burrows that served as dwelling-places or passageways for worms, crustaceans, etc. The study of the footprints of reptiles and supposed birds, which are so abundant on the surfaces of the Jurassic sandstones of Massachusetts and Connecticut, was named ichnology by E. Hitchcock, who described and figured a host of such impressions. Similar footprints are found in rocks of shallow-water origin of Mesozoic and Tertiary age all over the world.

The parts of animals likely to be preserved are always those that resist longest the destructive agencies that may attack them both before and after their entombment. The soft parts are seldom preserved, and often also the hard parts are destroyed. Because of this certain groups of animals are represented by insignificant parts of their anatomy, which, though of great importance to the paleontologist, are usually laid aside by the zoölogist as of trivial interest. Thus, the presence of sponges in certain formations is demonstrated by their isolated spicules; holothurians are recognized by their minute calcareous plates and anchors; worms by their teeth and dwelling-tubes; dibranchiate cephalopods by their internal shells; and many fish by their teeth, ear-bones (otoliths), spines, and dermal scales.

The manner of entombment of fossils varies greatly. In many cases the shells of mollusks have been dead a long time, and have become incrusted with polyzoans and corals before they were entombed. In other cases they were washed along the shore and broken and worn by the waves so that now in fragmentary condition they form 'shell limestones.' Among the crustacean fossils we find those that were killed suddenly, perhaps by some change in the temperature of the water, in which case their remains are usually well preserved. In some rocks of fresh-water or estuarine origin certain layers are covered with the remains of fish. These evidently lived in shallow pools that were either dried up suddenly or became so heated by the sun that the fish were killed, soon to be covered by sediment. Such conditions are frequent in the Catskill, Old Red Sandstone, and Jurassic formations. Myriads of insects of Tertiary time became entangled in the soft gum of coniferous trees, and are now preserved in the amber of the Baltic and the fossil resins of Africa and New Zealand.

The old ideas regarding fossils were curious and often fantastic. A few of the Greek and Roman philosophers had well-defined ideas of their true nature as entombed animals and plants that had once lived in the sea and upon the earth; but the majority of early writers attached to them some fanciful or supernatural origin. Thus they were explained as due to the *vis plastica*, or creative force that formed living things out of inorganic materials; as sports of nature; as due to some peculiar fermentative process in the earth, or as originating in some unknown influence of the stars. Another hypothesis, maintained for centuries, and even now persisting in uneducated communities, explains fossils as the remains of animals and plants washed up on the land, and there stranded by the waters of the Noachian deluge. These erroneous ideas persisted in the face of true explanations by some observers, until the beginning of 1800, when slowly the true nature of fossils and their relations to the rocks in which they are entombed began to be more universally understood, and at last during 1800 to 1840 there were laid the foundations of the science of paleontology .

For further information on the early ideas regarding fossils, consult: Lyell, *Principles of Geology*, vol. i. (New York, 1872) ; Von Zittel, *History of Geology and Palæontology*, translated by Ogilvie-Gordon (London and New York, 1901). For modes of fossilization and the relations between fossils and the rocks containing them, consult: Geikie, *Text-Book of Geology* (London and New York, 1893) ; White, "The Relations of Biology to Geological Investigation," in *Smithsonian Institution Report of the United States National Museum for 1892* (Washington, 1894) ; Marr, *Principles of Stratigraphical Geology* (Cambridge, 1898) ; Schuchert, "Directions for Collecting and Preparing Fossils," in *Smithsonian Institution United States National Museum, Bulletin No. 39* (Washington, 1895). See also PALEONTOLOGY; PALEOBOTANY; GEOLOGY.

FOSSIL BOTANY. See PALEOBOTANY.

FOSSIL FOOTPRINTS. See ICHNOLOGY.

FOSSIL FORESTS. The popular term applied to groups of petrified tree-trunks. Such forests may be found at the locality and in the position in which they grew, or, what is more frequently the case, they may have been carried some distance from their native soil before being buried and silicified. Fossil trees are not uncommon in the coal measures of the United States; but the most celebrated examples, belonging to more recent geological periods, are those of Arizona and the Yellowstone Park. Along the Little Colorado River, in Arizona, there are great numbers of well-preserved trees, scattered over the surface, some of which attain a diameter of 5 feet, and a length of more than 50 feet. The wood-cells have been replaced by silica, which is either colorless, like quartz, or shows the beautiful tints of agate, opal, and jasper; the structure of the wood is preserved to a most remarkable degree. Heavy beds of Triassic marls cover the surface, and it is in this formation that the trees are found. The silication was probably accomplished by hot alkaline waters, carrying dissolved silica; there is evidence of volcanic activity in the region which might well give rise to thermal springs. Many of the trees have been removed for cutting and polishing into various artistic objects, rivaling onyx and the rarer marbles in delicacy of color, and this wholesale destruction has given much concern lest the forest be entirely destroyed. A similar fossil forest in the Yellowstone Valley has many erect stumps of large size. Along the shore of Chesapeake Bay, south of Baltimore, is a forest in which the giant trunks of cypress rise from a bed of peat that is covered by Pleistocene clays. The Bad Lands of the Little Missouri abound in petrified trees which have been washed out from shales and sandstones of the Laramie group. Another forest, remarkable for the great size of its trees, is found in

Napa County, Cal. In England fossil trees were laid bare at Parkfield Colliery, near Wolverhampton, in 1844. Within the space of one-fourth of an acre there were 73 stumps with attached roots, the trunks lying prostrate in every direction. The wood was converted into coal. Silesia, Egypt, and the island of Antigua, in the West Indies, also have fossil forests. Consult: Marsh, *American Journal of Science* (New Haven, 1871); Hague and others, "Geology of the Yellowstone National Park," *United States Geological Survey, Monograph 32* (Washington, 1899).

FOS′SILIF′EROUS ROCKS (from Lat. *fossilis*, dug up, fossil + *ferre*, to bear). Rocks which contain organic remains. If we except the lowest metamorphic rocks of the Algonkian system, in which, as yet, no undoubted fossils have been found, the term is equivalent to 'stratified rocks,' and 'sedimentary rocks,' when used comprehensively; but it may also be applied to a particular bed, barren of organic remains, as in case of an unfossiliferous sandstone compared with a neighboring fossiliferous shale or limestone.

FOSSIL INVER′TEBRATES. See PALEONTOLOGY.

FOSSIL PLANTS. See PALEOBOTANY.

FOSSIL VER′TEBRATES. See PALEONTOLOGY.

FOSSOMBRONE, fôs′sôm-brō′nȧ. A city in central Italy, 44 miles northwest of Ancona by way of Fano, on the ancient Via Flaminia (Map: Italy, G 4). It has a cathedral containing a fifteenth-century altar by Domenico Rosselli, a gymnasium, technical schools, and important silk industries. In the vicinity are ruins of the Roman colony Forum Sempronii, which was destroyed by the Goths and Lombards; the hill of Pietralata, sometimes called Monte d'Asdrubale, where, according to tradition, the battle of the Metaurus took place in B.C. 207; and Furlo Pass, a tunnel, 96 feet long, 17 feet wide, and 14 feet high, hewn through the solid rock, as the inscription shows, by Emperor Vespasian in A.D. 76. Population, in 1881, of commune, 9100; in 1901, 10,428.

FOSSOMBRONI, fôs′sôm-brō′nē, VITTORIO (1754-1844). An Italian statesman and scientist, born at Arezzo. He studied at the University of Pisa, and after holding various other offices in the Grand Duchy of Tuscany, became Minister of Foreign Affairs (1796). When Tuscany was converted into the Kingdom of Etruria (1801), he refused office in the Council of State, but acted as Commissioner of Finance and proposed a scheme of monetary reform. In 1805 he became lieutenant-general of the Tuscan troops, and held high office under the French régime. He was a Senator of the Empire and president of a commission appointed by Napoleon to devise means of sanitation in Rome and the Pontine Marshes. When the grand duchy was reëstablished, in 1814, Fossombroni was made Prime Minister and president of the Legislature. Here his main work was putting the Tuscan finances on a sound footing. His published works are: *Sur les équations irréductibles au troisième degré* (1778); *Sur l'intensité de la lumière* (1782); the very important *Memorie idrolico-storiche sopra le val di Chiana* (1789); *Sur l'équation conditionelle* (1794); *Sur le principe de la vélocité virtuelle* (1796); and *Sur l'amélioration des marais Pontins* (1805).

FOSS′WAY, or **FOSSE,** THE. A road in England, built by the Romans. It ran probably from the seacoast at Seaton in Devonshire to Lincoln, with a continuation northward to the Humber, known as 'High Street.' The earliest mention of the Foss is in some Anglo-Saxon charters dating from the eighth century, and travelers along it enjoyed from early times the special protection known as the King's Peace. This sanctity it enjoyed together with the other three so-called Roman ways: Watling Street, Icknield Street, and Ermine Street. There can be no doubt that the Foss was constructed early during the Roman occupation in order to facilitate that easy communication so necessary for the military control of the island. It was still in good condition in the twelfth century, but has now almost disappeared. Consult Guest, "The Four Roman Ways," in *Origines Celticæ* (London, 1883).

FOS′TER, ABBY KELLEY (1811-87). An American reformer, born of Quaker parentage, at Pelham, Mass. After attending the Friends' School at Providence, R. I., she taught for several years in various Massachusetts towns. In 1837 she gave up teaching, and delivered a series of lectures in favor of the abolition of slavery. She was the first woman who had ever appeared before mixed audiences as an advocate of anti-slavery principles, and although she was the object of considerable harsh criticism, and was compelled to suffer indignities and rough treatment, her attempt met with considerable success. In 1845 she married Stephen Symonds Foster (q.v.), the abolitionist, and for several years they continued their speaking tours together. Afterwards she became an advocate of prohibition and woman's suffrage.

FOSTER, ANTHONY. The miserly custodian of Amy Robsart, at Cumnor Hall, in Scott's novel *Kenilworth*. He assists in her murder, but meets his reward by accidentally shutting himself in a secret chamber, in which he starves to death. Ashmole's *Antiquities of Berkshire* do not agree with Scott's account of Foster's death, but state that after the murder he pined away and died of remorse.

FOSTER, Sir AUGUSTUS JOHN (1780-1848). An English diplomat. Through his mother's influence (she had married the Duke of Devonshire after the death of John Thomas Foster) he was made secretary of the English legation at Naples, and in 1811 was sent to the United States as Minister. At the outbreak of the war he returned to England and was elected member of Parliament. Two years later he was made Minister at Copenhagen; passed ten uneventful years there, and in 1824 went to Turin, where he stayed until 1840 and then retired. He committed suicide on August 1, 1848, probably being deranged at the time.

FOSTER, BENJAMIN. An American landscape painter, born at North Anson, Maine. He was a pupil of Abbott Thayer in New York City, and of Olivier Merson and Aimé Morot in Paris. He is particularly successful with the misty effects of early morning and evening, and moonlight nights, and his pictures usually represent such subjects. His "Mists of the Morning" (1901) obtained the Webb prize. He received a medal at the Columbian Exposition of 1893, a bronze one at the Paris Exposition of 1901, a silver medal at Carnegie Institute, Pittsburg, 1900, and another at the Pan-American Exposition of 1901. His night scene at the Paris Exposition was purchased by the French Government for the Luxembourg Gallery.

FOSTER, Birket (1825-99). An English painter and engraver, born at North Shields, February 4, 1825. Early apprenticed to E. Landell, a wood-engraver, he devoted some years to illustrating, and also engraved plates for Gray's *Elegy, The Ancient Mariner, Old English Ballads,* and Longfellow's *Evangeline.* He drew for the *Illustrated London News,* and was for a time represented in the early numbers of *Punch.* About 1859 he began drawing in water-colors, and in 1862 was made a member of the Society of Painters in Water-Colors. His choice of subjects was drawn mostly from rural life, and he especially emphasized the landscape element. He became very popular, and his works were much reproduced in photographs and chromos. Among those well known are "Nutting," "The Bird's Nest," "Sailing the Boat," "Cows in the Pool," "Feeding the Ducks," "Arundel Mill," "Castle of Rheinfels," etc. At a later period he also painted oils, but not with equal success. Consult: Hulsh, *Birket Foster: His Life and Work* (London, 1890); Scherer, *The Birket Foster Album* (Münich, 1880).

FOSTER, Charles (1828—). An American politician and Secretary of the Treasury. He was born near Tiffin, Ohio. He was educated at Norwalk Academy, and entered his father's store, becoming a partner, and finally succeeding to the control of the business, which under his efficient management became one of the largest retail and wholesale mercantile establishments in the State. In connection with this business he established a bank, and dealt largely in grain and produce. During the Civil War he actively aided in the recruiting and equipment of the Ohio troops. It was not until 1870 that he entered political life. In that year he was nominated by the Republicans of his district for Congress, and was elected. He was reëlected in 1872, 1874, and 1876. In the winter of 1874-75 he visited New Orleans as chairman of a sub-committee of Congress appointed to examine into frauds in Louisiana. In 1879 he was nominated for Governor of Ohio, and was elected by 17,000 majority, and two years later, in 1881, was reëlected, serving until January 1, 1884. His administration was marked by reforms in the management of State institutions, and by an attempt to reform the taxation of the liquor traffic. In 1889 Foster was appointed by President Harrison chairman of a commission to draw up a treaty with the Sioux Indians. In February, 1891, he succeeded William Windom as Secretary of the Treasury in Harrison's Cabinet.

FOSTER, Frank Hugh (1851—). An American clergyman of the Congregational Church. He was born in Springfield, Mass., graduated at Harvard in 1873, from 1873 to 1874 was assistant professor of mathematics in the United States Naval Academy, and in 1877 graduated at Andover Theological Seminary and was ordained to the Congregational ministry. In 1877-79 he was pastor at North Reading (Middlesex County), Mass.; in 1879-82 studied at Göttingen and Leipzig; and from 1882 to 1884 was professor of philosophy in Middlebury (Vt.) College. In 1884 he was appointed professor of Church history in the Oberlin (O.) Theological Seminary. He became an editor of the *Bibliotheca Sacra* in 1884, and wrote "Zwingli's Theology, Philosophy, and Ethics" in Dr. S. M. Jackson's *Huldreich Zwingli* (1901). He was also an associate editor of Jackson's *Concise Dictionary of Religious Knowledge and Gazetteer* (1891).

FOSTER, George Burman (1858—). An American theologian, born at Alderson (Monroe County), W. Va. He graduated in 1883 at West Virginia University (Morgantown, W. Va.), at the Rochester (N. Y.) Theological Seminary in 1887, and was pastor of the First Baptist Church of Saratoga Springs (Saratoga County), N. Y., from 1887 to 1891. In 1891-92 he studied at the universities of Göttingen and Berlin, from 1892 to 1895 was professor of philosophy in McMaster University, and in 1895 was appointed to the chair of systematic theology in the University of Chicago.

FOSTER, George Eulas (1847—). A Canadian political leader. He was born in Carleton, New Brunswick, and graduated at the University of New Brunswick in 1868. For three years he taught school at Fredericton, and in 1871 was appointed to the chair of history and classics in his *alma mater,* spending two years in study at Edinburgh and Heidelberg before entering upon his duties. He resigned his professorship in 1879, and after two years spent in lecturing on temperance problems in Canada and the United States, he entered politics, and was returned in 1882 to the Dominion House of Commons as a Liberal-Conservative from Kings County, New Brunswick. His scholarship and his fluency as a speaker won him early recognition, and in December, 1885, he entered Sir John Macdonald's Cabinet, as Minister of Marine and Fisheries. In this office he was called upon to prepare the case for Canada to be presented to the joint commission in Washington which had been appointed to settle the long-standing dispute over the deep-sea fisheries. His brief for Canada was an able presentation, and left its impress on the Bayard-Chamberlain Treaty of 1888. In May, 1888, he succeeded Sir Charles Tupper as Minister of Finance, and continued to hold this portfolio in all the succeeding Cabinets until the fall of the Conservative Party from power in January, 1896. He is an ardent champion of British Imperial federation.

FOSTER, Henry (1796-1831). An English navigator. He entered the navy in 1812; accompanied the commission on the northwest boundary between the United States and British North America, and made surveys of the mouth of the Columbia. In 1819-20 he sailed to South America, and began his important observations with the pendulum. He was a member of the expedition to Greenland and Norway in 1823; and in the following year, and again in 1827, sailed with Parry on his northwestern and polar voyages. The results of his observations on the variation of the needle were printed in the *Philosophical Transactions* (1826), and he received the Copley medal and the grade of commander for this work. In 1828 he started for the South Seas to make pendulum observations and to study ocean currents and meteorology. He rounded Cape Horn after observations near Montevideo, touched on the South Shetland Islands, and after much cruising landed at Panama, and measured by rockets the meridian distance between Panama and Chagres. He was drowned in the river Chagres a day or so after. His note-book was stolen, but his other papers were published by Webster in a *Narrative of a Voyage to the Southern Atlantic Ocean* (1834).

FOSTER, ISAAC (1740-81). An American physician and surgeon, born in Charlestown, Mass. He graduated at Harvard in 1758, studied medicine in Paris and London, and returned to practice at Charlestown. He was a delegate to the first Provincial Congress of Massachusetts in October, 1774, and on the outbreak of the Revolution he gave up his large practice and joined the Continental Army as a volunteer surgeon. In the fall of 1775 he was appointed by Washington acting director-general of the military hospital service of the American forces. He remained in the service after the appointment of Dr. John Morgan to that position by Congress, was personally attached to Washington's headquarters. and in 1777 was surgeon-in-chief of the Eastern Department of the Continental armies. He resigned in 1780 on account of failing health.

FOSTER, JOHN (1770-1843). An English essayist, son of a weaver, born in the parish of Halifax, Yorkshire, and educated for the ministry at the Baptist college in Bristol. After preaching for several years to small congregations, he resolved to devote himself mainly to literature. In 1805 appeared his popular *Essays, in a Series of Letters.* The volume contained four essays, entitled: "On a Man's Writing Memoirs of Himself," "On Decision of Character," "On the Application of the Epithet Romantic," and "On Some of the Causes by which Evangelical Religion has been rendered less Acceptable to Persons of Cultivated Tastes." In 1808 Foster married a Miss Snooke, to whom his essays were addressed, and retired to Bourton, a village in Gloucestershire, where he lived a studious life, preaching, however, in the neighboring villages on Sundays. In 1820 appeared his celebrated *Essay on the Evils of Popular Ignorance,* in which he urges the necessity of a national system of education. To the *Eclectic Review* he contributed nearly two hundred articles. He died at Stapleton, near Bristol. Consult his *Life and Correspondence,* edited by Ryland (London, 1846; republished in Bohn's Library, 1852).

FOSTER, JOHN GRAY (1823-74). An American soldier, born at Whitefield, N. H. He graduated at West Point in 1846, and served with the rank of brevet second lieutenant in the southern campaign of the Mexican War. From 1855 to 1857 he was principal assistant professor of engineering at West Point, and between 1857 and 1861 served as superintending engineer of the survey of the site of the fort at Willets Point, N. Y., and of the construction of Fort Sumter and the repairing of Fort Moultrie in Charleston Harbor. On December 26, 1860, he received the brevet of major for his part in transferring the Federal garrison from Fort Moultrie to Fort Sumter, and on April 12-13 he assisted in the defense of the latter fort. He then acted as superintending engineer of the construction of the fort on Sandy Hook, N. J., from May to November, 1861; was raised to the rank of brigadier-general of volunteers in October, 1861; and commanded a brigade during General Burnside's North Carolina expedition of December, 1861, to July, 1862, receiving the brevet of colonel. He became a major-general of volunteers in July, 1862; and from July, 1862 to July, 1863, was in command of the Department of North Carolina. From July to November, 1863, he commanded the Department of Virginia and North Carolina, and from December, 1863, to February, 1864, the Army and Department of the Ohio, and was brevetted brigadier-general and major-general in the Regular Army. He was in command of the Department of the South from May, 1864, to February, 1865, and of the Department of Florida from August, 1865, to December, 1866; was mustered out of the volunteer service in September, 1866, and subsequently, until his death, was engaged as lieutenant-colonel of engineers on various important engineering works for the Government, notably the improvement of Boston Harbor and the construction of the defenses in Portsmouth Harbor. In addition to a number of magazine articles, he published *Submarine Blasting in Boston Harbor* (1869).

FOSTER, JOHN WATSON (1836—). An American diplomat, born in Pike County, Ind. In 1855 he graduated at the Indiana State University. At the beginning of the Civil War he entered the Union service as a major of volunteers, and after attaining the rank of colonel headed a brigade in General Burnside's expedition to East Tennessee, and was the first to occupy Knoxville (1863). In 1873-80 he was Minister to Mexico, in 1880-81 Minister to Russia, and in 1883-85 Minister to Spain. In 1891 he was engaged as a special agent to assist President Harrison and Secretary Blaine in the negotiation of reciprocity treaties, in which capacity he assisted in settling the dispute with Chile. During the Bering Sea controversy he acted as agent to prepare and conduct the case of the United States before the arbitration tribunal. Upon the death of Mr. Blaine General Foster succeeded to the Secretaryship of State (1892-93). Later he was legal adviser to the Chinese plenipotentiaries in their peace negotiations with Japan (1895); again represented the United States in the Bering Sea question (1897); and in 1898 was a member of the Anglo-American Joint High Commission to settle the disputes between Canada and the United States. Besides numerous magazine articles, he published *A Century of American Diplomacy* (1900).

FOSTER, JOHN WELLS (1815-73). An American geologist and paleontologist. He was born at Brimfield, Mass., and graduated at Wesleyan University, Middletown, Conn., in 1834. He removed to Ohio, studied law, and was admitted to the bar at Zanesville; but having spent his leisure in the study of geology, he accepted a position as assistant in the Geological Survey of Ohio in 1837, and was employed until 1844 in investigating the coal-beds of the State. In 1844 he returned to Massachusetts. In 1847 he was assigned with Josiah Dwight Whitney (q.v.) to assist Prof. Charles T. Jackson in a geological survey of the Lake Superior region. Foster and

Whitney completed the work alone, and the results of their investigations were published by authority of Congress as *A Synopsis of the Explorations of the Geological Corps in the Lake Superior Land District in the Northern Peninsula* (1849), and *Report on the Geology and Topography of a Portion of the Lake Superior Land District in the State of Michigan: Part I., The Copper Lands* (1850); *Part II., The Iron Region* (1851). For the next few years Foster remained in Massachusetts, where he was active in the 'Native American' movement, and was associated with Henry Wilson in the organization of the Republican Party in the State. In 1858 he removed to Chicago, where he lived for the remainder of his life, for some years holding the chair of natural philosophy in the old University of Chicago, and devoting himself to scientific investigation, in particular to the paleontology and ethnology of the Mississippi Valley. He was president of the American Association for the Advancement of Science (1869). Among his later published works are: *The Mississippi Valley* (1869); *Mineral Wealth and Railroad Development* (1872); and *Prehistoric Races of the United States* (1873).

FOSTER, Judith Ellen (Horton) (1840—). An American lecturer, born at Lowell, Mass. She removed to Iowa, studied law, and was admitted to the State bar in 1872. She also became superintendent of the Legislative Department of the Woman's Christian Temperance Union, and when that organization was affiliated with the Prohibition Party, identified herself with the Non-Partisan Woman's Christian Temperance Union, to whose presidency she was elected. She has been known as a popular lecturer on various topics, and has published a *Constitutional Amendment Manual* (1882).

FOSTER, Lafayette Sabine (1806-80). An American political leader and legislator. He was born in Franklin, Conn., and graduated at Brown University in 1828. He studied law, settled at Norwich, and took an active part in politics as a Whig. He was elected to the Connecticut Legislature in 1839 and 1840, and was chosen to its sessions of 1846, 1847, and 1848, in the latter two sessions acting as speaker of the Assembly. In May, 1854, he was elected to the United States Senate by the combined votes of Whigs and Free-Soil Democrats. In 1856 he joined in the movement for the organization of the Republican Party, and in 1860 was reëlected to the Senate as a Republican. During the entire Civil War period he was chairman of the important Committee on Foreign Affairs, and was often consulted by President Lincoln. In 1865 he was chosen president *pro tempore* of the Senate, and on the death of Lincoln and the succession of Johnson he became, according to the Constitution, the acting Vice-President of the United States. He declined to be a candidate for reëlection in 1867, became a Liberal Republican in 1872, and two years later he was an unsuccessful candidate for Congress on the Democratic ticket. He was a judge of the Connecticut Superior Court from 1870 to 1876, and in 1878-79 was a commissioner to settle the New York-Connecticut boundary dispute.

FOSTER, Sir Michael (1836—). An English physiologist, born at Huntingdon. He was educated at University College, London, and in 1869 became professor of practical physiology there. A year afterwards he accepted a similar position at Trinity College, Cambridge, and in 1883 was appointed professor of physiology at the University of Cambridge. In 1899 he was president and afterwards was elected secretary of the British Association; and in 1900 he was elected to Parliament as representative of London University. His publications include: *Report on Modern Microscopes* (1867); *Primer of Physiology* (1874); *Studies from the Physiological Laboratory in the University of Cambridge* (1876-77); *A Text-Book on Physiology* (1877); *The Elements of Embryology* (1874), with F. M. Balfour; and *Course of Elementary Practical Physiology* (1876), with J. N. Langley.

FOSTER, Randolph Sinks (1820—). An American clergyman of the Methodist Episcopal Church, born at Williamsburg (Claremont County), Ohio. He studied at Augusta College (Millersburg, Ky.), and entered the itinerant ministry of the Methodist Episcopal Church in the Kentucky conference in 1837. Subsequently he was transferred to the Ohio and New York conferences, from 1857 to 1860 was president of the Northwestern University (Evanston and Chicago, Ill.), and from 1860 to 1862 held pastorates successively in New York City and Ossining, N. Y. In 1868 he became professor of systematic theology in Drew Theological Seminary (Madison, N. J.), and in 1872 president of that institution. He was elected a bishop in 1872, and made visits to the missions of his Church in South America (1874), Germany and Scandinavia (1874 and 1883), India (1882), Italy (1883), and Mexico (1886). His publications include: *Objections to Calvinism as It Is* (1848; letters originally published in the *Western Christian Advocate* in reply to Dr. N. L. Rice, of the Presbyterian Church); *Ministry for the Times* (1852); *Studies in Theology* (1886).

FOSTER, Sir Robert (1589-1663). An English jurist, the youngest son of Sir Thomas Foster, a judge under James I. He was called to the bar in 1610; was knighted and made a justice of common pleas in 1640. An eager upholder of Charles, he condemned Captain Tarpin (1644), but was merely removed from office by Parliament, while his colleague was impeached for high treason. During the Commonwealth he practiced as a conveyancer, and on the Restoration he was appointed Chief Justice of the King's Bench (1660), and dealt as sternly with sectaries and political prisoners as if he had not himself enjoyed great toleration under Cromwell. He urged the King to approve the execution of Sir Harry Vane, and was justice at the trial of Sir Charles Sedley in 1663.

FOSTER, Stephen Collins (1826-64). An American song composer, born at Lawrenceville, near Pittsburg, Pa. Foster's musical gifts seem to have been natural, as he taught himself the flageolet when he was but seven. Many of his songs, the first of which, "Open Thy Lattice, Love," was published in 1842, have become so popular that they may be regarded as veritable folk-songs; for which reason it is fortunate that, although simple in technical treatment, they are, as a rule, refined and graceful in their melody. "Louisiana Belle," "Old Uncle Ned," "My Old Kentucky Home," "Massa's in the Cold, Cold

Ground," "Ellen Boyne," the famous "Old Folks at Home" ("Down on the Suwanee River"), "Come Where My Love Lies Dreaming," are some of the most popular of Foster's 175 published songs. His last song was "Beautiful Dreamer." Foster was improvident, and notwithstanding the enormous sales of his songs (e.g. "Old Folks at Home," 300,000 copies), was frequently harassed for want of money, and obliged to sell his manuscripts outright for pitiably small prices. He died in New York.

FOSTER, Stephen Symonds (1809-81). An American abolitionist, born at Canterbury, N. H. He followed the carpenter trade for several years, then entered Dartmouth College with the intention of preparing for the ministry, and graduated in 1838. While studying at the Union Theological Seminary he became imbued with abolitionist ideas, and determined to give up the ministry and become an anti-slavery advocate. This decision he followed, and soon became widely known as an earnest and fearless orator. The refusal of the churches to coöperate in the abolition movement aroused his indignation, and he bitterly denounced both churches and clergy as hypocritical and non-Christian. His radicalism caused him frequently to be attacked by mobs, and his method of appealing to the people by entering churches during service and addressing the audiences unannounced gave rise to numerous grave disturbances and precipitated several riots. In 1845 he married Abby Kelley (see Foster, Abby Kelley). Besides numerous articles on the slavery question in magazines, he published *The Brotherhood of Thieves: A True Picture of the American Church and Clergy* (1843, reprinted 1886).

FOSTER, Theodosia Toll (1838—). An American author, born at Verona, N. Y., and educated at Oneida Seminary. She married James H. Foster in 1869, and for many years was principal of the Home School at Verona. She has written her many stories under the pen name of "Faye Huntington," including *Mr. McKenzie's Answer* (1876); *Ripley Parsonage* (1877); *From Different Standpoints*, with Mrs. Alden (1878); *Echoing and Re-Echoing* (1879); *Mrs. Deane's Way* (1880); *Millerton People* (1884); *What Fide Remembers* (1885); *The Boynton Neighborhood* (1895); *A Modern Exodus* (1897); *His First Charge* (1897); and *Lewis Elmore, Crusader* (1898).

FOSTO′RIA. A city in Seneca and Hancock counties, Ohio, near the boundary line of Wood County, 35 miles south by east of Toledo; on the Baltimore and Ohio, the Lake Erie and Western, and three other railroads (Map: Ohio, C 3). It is the seat of the Ohio Normal University. Fostoria was settled by the father of Charles Foster, Governor of Ohio and Secretary of the United States Treasury in 1891-93, and by the latter was built up and made an important manufacturing place. It has several glass-factories, flour-mills, brass and iron works, a carriage-factory, spoke and bending works, planing-mills, stave and barrel factories, carbon-works, a safe-factory, etc. In the vicinity are oil-fields and a productive farming section. The government, under a charter of 1889, is vested in a mayor, biennially elected, and a city council. The water-works are owned and operated by the municipality. Population, in 1890, 7070; in 1900, 7730.

FOTHERGILL, fŏth′ẽr-gĭl, Jessie (1856-91). An English novelist, born in Manchester, where her father was a wealthy cotton manufacturer. Her first novel, *Healey*, was published in 1875, and her great success, *The First Violin*, in 1877. Her novels, most of which depict life on the moorland and in the factory towns of the north of England, are remarkable for their powerfully drawn studies of character. Her published books, besides those mentioned, include: *Aldyth* (1876); *The Wellfields* (1880); *Kith and Kin* (1881); *Made or Marred* (1881); *One of Three* (1881); *Peril* (1884); *Borderland* (1886); *The Lass of Leverhouse* (1888); *A March in the Ranks* (1890); and *Oriole's Daughter* (1893). A dramatization of *The First Violin* by Sidney Bowkett has been successfully produced.

FOTHERGILLIA, fŏth′ẽr-gĭl′lĭ-ȧ. A variety of Nerine cuneifolia grown in conservatories to a slight extent for its numerous brilliant red flowers, which are borne in umbels on long scapes. The flowers are especially attractive on account of their glistening in the light, as if sprinkled with hoar frost. Owing to the habit of making growth during the winter and blossoming during the autumn, this plant, like others of its genus, will not become popular as a florist's flower, but will be grown only in private greenhouses. See Colored Plate of Amaryllidaceæ.

FOTHERGILL PROCESS. A process in photography which has for its object the preservation of sensitive plates ready for exposure. It consists in the partial removal of the free silver nitrate which adheres to the collodion film when it is withdrawn from the sensitizing bath by washing with water, and the subsequent conversion of the remaining free silver nitrate into silver aluminate and chloride by pouring over the plate dilute albumen containing ammonium chloride, the excess of the albumen being finally washed off with water. The plates are set aside to drain on folds of blotting-paper, and when dry are ready for use.

FOTHERINGAY, fŏth′ẽr-ĭn̤-gā, The. The stage name of Emily Costigan (q.v.), in Thackeray's *Pendennis*.

FOTHERINGAY CASTLE. A famous castle which once stood near Peterborough, Northampton, England. It was built in 1405, and was the birthplace of Richard III. in 1452, and the place of execution of Mary, Queen of Scots. It was demolished by James I. Its site is at present occupied by a church noteworthy for its admirable architecture, belonging to the Perpendicular period.

FOUCAULT, fo͞o′kȯ′, Jean Bernard Léon (1819-68). A French physicist. He was born in Paris and was educated for the medical profession. His early physical researches were carried on in connection with Fizeau, and the first direct measurements of the velocity of light were due to independent researches by these physicists. In 1850, in the course of his experiments, Foucault proved that the velocity of light in air was greater than in water. His apparatus consisted of a plane mirror capable of rapidly revolving about a vertical axis, and a concave mirror to which the light was reflected from the first mirror. An achromatic lens, a transparent mirror to reflect the light on to an eye-piece, and a source of light comprise the other essential features of the apparatus, which differed from that of Fizeau's in that it could be entirely contained in a laboratory, and did not involve the reflection of the beam of light from a mirror far distant. In 1851 he demonstrated the rotation of the earth on its axis by the diurnal rotation plane of oscillation of a long pendulum with a heavy weight. The following year he invented the gyroscope (q.v.). In 1854 he was appointed physicist at the Paris Observatory. In 1857 he invented the polarizing prism known by his name, and in 1858 succeeded in giving to the mirrors of reflecting telescopes the form of a spheroid or a paraboloid of revolution. He adjusted the great reflector in the telescope of the Paris Observatory in 1859. In 1865 he published a series of papers on a modification of Watt's governor, showing how its period of revolution could be made constant, and on an apparatus for regulating the electric light. He also showed how the sun can be observed without injury to the eye from the excess of light. He was scientific editor of the *Journal des Débats* from 1845. In conjunction with Regnault he published an important paper on binocular vision. He received the decoration of the Legion of Honor in 1850, and was made an officer in 1864. For his biography consult: *Léon Foucault, sa vie et son œuvre scientifique* (Brussels, 1879); and Lissajous, *Notice historique sur la vie et les travaux scientifiques de Léon Foucault* (Paris, 1875).

FOUCAULT CURRENTS, or Eddy Currents. Induced currents of electricity generated in a plate or other mass of metal by its motion with regard to a magnetic field or by variations of that field. These currents circulate entirely within the metal, and their energy is expended in generating heat. They are known as Foucault currents, after this famous physicist, who demonstrated that when a copper disk was rotated between the poles of a strong electro-magnet its temperature was greatly increased, though the currents thus produced had been previously observed by other investigators. They play an important part in electrical work, and their effect was first noticed in the construction of compasses where it was found that the magnetic needle would come to rest much quicker when it was placed above a plate of metal. That the currents were due to induction (q.v.) was shown by Faraday, and Foucault and others constructed interesting apparatus to exhibit their action. In the galvanometer a useful application is found when it is desired to damp the vibrations of the magnetic needle, so that it will return to a point of rest quickly through the action of the magnetic field generated by the induced currents in surrounding plates or masses of metal. The most important effects of Foucault currents occur perhaps in dynamo-electric machinery (q.v.), and in the armatures of dynamos and motors and the cores of transformers a laminated form of construction is employed and the different parts separated from each other, so that there will be no currents circulating as the armature revolves or the alternations of current occur. The greatest care in the design and construction is necessary in such cases in order to prevent the generation of a large amount of heat. See Dynamo-Electric Machinery; Electricity; Induction; Magnetism; Transformer.

FOUCAUX, fo͞o'kō', Marie Filon (1842—). A French author, the wife of Philippe Edouard Foucaux. Under the pseudonym of Mary Summer she wrote several works on Sanskrit literature, including: *Histoire du Bouddha Sâkya-Mouni* (1874); *Contes et légendes de l'Inde ancienne* (1878), a work which was crowned by the Academy; and *Les héroïnes de Kâlidâsa et les heroïnes de Shakespeare* (1879). She also wrote several studies and romances of the Empire and the Restoration, among which are: *Le dernier amour de Mirabeau* (1877); *Les belles amies de M. de Talleyrand* (1880); and *Une intrigante de la Restauration* (1888).

FOUCAUX, Philippe Edouard (1811-94). A French Orientalist, born at Angers. He was a pupil in Sanskrit of Eugene Burnouf at Paris, and directed a course in Thibetan at the Bibliothèque Royale. In 1852 he was appointed to occupy temporarily the chair of Sanskrit literature in the Collège de France, and in 1862 succeeded Burnouf as titular professor. His publications include: *Grammaire de la langue thibétaine* (1859); *Onze episodes du Mahâbhârata* (1861); and *Le religieux chassé de la communauté* (1873).

FOUCHÉ, fo͞o'shā', Joseph, Duke of Otranto (1754-1820). A French politician and Minister of Police. He was born at Pellerin, in the Department of Loire-Inférieure, September 19, 1754. His father was a merchant captain, and the son was educated with a view to following the same calling; but early in life young Fouché decided for the Church, and after attending the Oratory at Paris, became a teacher at Juilly, Arras, and Vendôme, successively. In 1789 he had risen to be principal of the College of Nantes. As soon as the Revolution seemed likely to succeed, Fouché threw aside his ecclesiastical habit and had himself elected a deputy to the National Convention (1792) from Loire-Inférieure. No one was more ardent in bringing about the death of Louis XVI. than Fouché, who took a leading part in the inauguration of the Worship of Reason, and in the spoliation of the churches which took place in 1793-94—a measure which replenished the coffers of the Republic. In October, 1793, he was sent with Collot d'Herbois as commissioner to Lyons, and showed himself a monster of cruelty, boasting publicly of the number of victims he had caused to be put to death. Excluded from the Jacobin Club by Robespierre, after he had held the presidency, Fouché was in danger of losing his life, and was even arrested, but was released by the amnesty of October 26, 1795. He ingratiated himself with Barras by betraying Babœuf and his friends to the Directory, and was sent as Minister Plenipotentiary to Milan. There he plotted against the Cisalpine Republic and was expelled, but immediately was sent as Ambassador to Holland. A few months later he was recalled and made Minister of Police, July, 1799. In this capacity he showed great vigor; he suppressed the newly organized Jacobin Club, and a large number of newspapers, and created an extensive system of espionage. He was won over to the Bonapartist cause, however, participated in the coup d'état of the 18th Brumaire, and became Minister of Police under the Consulate. In the new Government, strangely enough, he became the champion of moderation; by his advice the list of émigrés was closed, a general amnesty was proclaimed, and a policy of conciliation steadily pursued. He was forced to resign his office in 1802, though raised to the Senate with a large pension, but he still kept up a police system of his own, and in 1804 was reappointed to his former place on account of the many plots against the life and power of Napoleon. It was at this time that he made his famous remark on the execution of the Duc d'Enghien: "It is worse than a crime; it is a blunder."

Under the Empire Fouché was Minister of the Interior as well as head of the police, and controlled the internal government of France during the frequent and prolonged absences of the Emperor. In 1809, on the occasion of the landing of English forces at Walcheren, he issued a proclamation calling on France to show that she could repel the invader without the presence of the Emperor. The proclamation had the desired effect, but it so incensed Napoleon that Fouché was deprived of the portfolio of the Interior, and shortly afterwards another mistake in diplomacy cost him his office as Minister of Police (1810). Disobeying the commands of the Emperor to take charge of the Government of Rome, and to deliver up secret papers which were in his possession, Fouché fell into further disgrace, and fled from France. Later he was allowed to return and reside on his estate at Pont Carré. In 1813 he was sent as governor to the Illyrian Provinces, but after the battle of Leipzig was recalled, and sent to Naples to watch Murat. Fouché, however, had been in secret negotiations with the Bourbons for some time, and did little to prevent Murat's defection. In 1814, on returning to Paris, he was welcomed by Louis XVIII. and offered the police portfolio, but declined. He foresaw the return of Napoleon from Elba, and during the Hundred Days resumed his police functions, though at heart a traitor to the cause he espoused. After Waterloo he went over to the Bourbons and aided in the pacification of the country as Minister of Police, but the law against the regicides in 1816 exiled him from France. He retired to Prague, became an Austrian subject in 1818, and spent his last years at Triest, where he died, December 25, 1820. There is no good single work on Fouché. His *Mémoires* (4 vols., Paris, 1822-24; English translation, 1828-29), while based on genuine documents, have been declared a forgery by his family. For various aspects of his career consult: Martel, *Types révolutionnaires: Etude sur Fouché* (Paris, 1879); Desmarest, *Témoignages historiques, ou quinze ans de haute police sous Napoléon* (Paris, 1833); Lord Brougham, *Historical Sketches*, vol. iii. (London, 1858).

FOUCHER, fo͞o'shȧ', JEAN (1508-67). An explorer and colonizer in South America. He was born at Cambrai, Flanders, became a sailor, and accompanied Sebastian Cabot on the voyage to South America which resulted in the discovery of the Paraguay River. He remained at the mouth of the Plata until 1529, and after a few years in Europe, joined the Spanish expedition of Mendoza to Paraguay, in 1534, as pilot. After the founding of Buenos Ayres, he led an exploring party inland, and after an adventurous journey in which he reached as far as the base of the Cordilleras in Peru, he returned to the eastern coast in 1539. He became one of the advisers of Cabeza de Vaca, the Governor, whom he induced to adopt a friendly policy toward the natives, and with whom, in 1544, he was imprisoned and sent back to Spain. In the following year he was pardoned, and returned to South America, where, as Governor of Entre Rios, he continued his explorations, and did much to establish friendly relations between the colonists and Indians.

FOUCHER DE CAREIL, fo͞o'shȧ' de kȧ'rȧ'y', LOUIS ALEXANDRE, Count de (1826-91). A French diplomat and author, born in Paris. In 1872, he became Prefect of the Department of Seine-et-Marne, in 1876 a member of the Senate, and in 1883 Ambassador at the Court of Vienna. The last-named post he resigned in 1886. He was a recognized authority on the philosophy of Leibnitz. He wrote a series of expository volumes on the subject, including: *Réfutation inédite de Spinoza par Leibniz* (1854); *Leibniz, la philosophie juive et la Cabale* (1861); and *Leibniz, Descartes et Spinoza* (1863). His chief literary work was connected with his edition of the *Œuvres de Leibniz* (1859 et seq.; 2d ed. 1867 et seq.; to include, as projected, 20 vols., of which 7 appeared).

FOUGÈRES, fo͞o'zhâr'. The capital of an arrondissement in the Department of Ille-et-Vilaine, France, picturesquely situated on a hill on the Nançon River, 28 miles northeast of Rennes (Map: France, E 3). It is a handsome, well-built town, with wide streets, and in the old quarter retains mediæval traces in the ancient houses with arcades which overhang the sidewalks. There are also some remains of its ancient walls. The castle of Fougères, a picturesque object, was at one time considered the key to Brittany. The churches of Saint Sulpice and of Saint Leonard have many interesting features; a college and three hospitals are among the principal public buildings. In the neighborhood is a great forest containing prehistoric megalithic remains. Population, in 1901, 20,952. Fougères is celebrated for the engagement which took place in the vicinity between the Vendean Royalists and the Republicans, November 15, 1793.

FOUILLÉE, fo͞o'yȧ', ALFRED JULES EMILE (1838—). A French philosopher, born in La Pouëze, Maine-et-Loire. He began his career as a teacher in the colleges of Louhans and Auxerre, and the lycée of Carcassonne, and was afterwards professor of philosophy at Douai and Montpellier. For three years (1872-75) he held an important position in the normal school at Bordeaux, but was forced by ill health to retire, and devoted himself to the production of treatises upon the philosophies of Plato and Socrates, a *Histoire de la philosophie* (1875, 6th ed. 1892); *L'idée moderne du droit en Allemagne, en Angleterre et en France* (2d ed. 1883); *La science sociale contemporaine* (2d ed. 1885); *Critique des systèmes de morale contemporaine* (2d ed. 1887); *L'enseignement au point de vue national* (1891); *La psychologie des idées-forces*, and other philosophical works, besides contributing articles to the *Revue des Deux Mondes* and the *Revue Philosophique*. His substance is speculative and his style graceful.

FOUL BROOD. A virulent contagious disease of bees due to the action of a pathogenic organism, Bacillus alvei. The disease, which has been known since the time of Aristotle and occurs wherever bee-keeping is practiced, affects chiefly the young bees, and especially weak and badly nourished colonies. When attacked by foul brood the larvæ become extended, lose their plumpness, turn yellow and later brown. Dead larvæ emit a disagreeable odor. When the larvæ die after the cells have been capped, the caps become brownish and sunken; perforations may later be developed. As a rule, the bees show a disinclination to work, remain fanning at the entrance to the hive, and do not remove the dead larvæ. The adults may also become infected. The disease varies in its virulence, and is at times much more fatal than at others. Perhaps the robbing of diseased hives by healthy bees is the chief method by which the disease is spread; but infection may result from the visiting of flowers which have previously been visited by diseased bees. Wax and other bee-keeping supplies may spread the disease. The bacillus of foul brood grows in the presence or the absence of oxygen. The spores may be destroyed by long exposure to direct sunlight or for a period of 2¾ hours to a temperature of 100° C. The disease may be eradicated by destroying infected bees, combs, frames, and hives; removing the bees, allowing them to fast for a few days, and then placing them on new comb; or by chemical treatment, such as feeding certain antiseptics in syrup, or in using them to fumigate infected hives and supplies. Formalin has given best results, but carbolic acid, salicylic acid, camphor, thymol, creolin, eucalyptol, and naphthol have been successfully employed. For literature, consult publications referred to under BEE-KEEPING, and Harrison, "The Foul Brood of Bees," in *Centralblatt für Bakteriologie Parasitenkunde und Infektionskrankheiten*, vol. vi., 1900, Nos. 13 to 16 (Jena, 1900).

FOULD, fo͞old, ACHILLE (1800-67). A French financier and statesman. He was born in Paris, November 17, 1800, of Jewish parents, and was educated at the Lycée Charlemagne. Fould came naturally by his financial gifts, his father being a wealthy banker of Paris. In 1842 he began his political career as a member of the Council-General of the Department of Hautes-Pyrénées, and was immediately after elected a Deputy for Tarbes, the chief town of that Department. In the Chamber of Deputies he acquired a high reputation for the ability with which he handled questions of finance, and in 1844 was appointed reporter to the commission on stamps on newspapers. At that time he was a stanch supporter of Guizot. After the Revolution of 1848, however, he accepted the new régime, and offered his services to the Provisional Government. In July, 1848, he was elected to the Constituent Assembly for the Department of the Seine, and rendered valuable services to the Government, in particular by advising against the issue of assignats. During the Presidency of Louis Napoleon he was four times Minister of Finance, and his repeated resignations for State reasons did not prevent him from being again appointed on the occasion of the coup d'état, December 2, 1851. He once more resigned his position in January, 1852, in consequence of the decree ordering the confiscation of the property of the Orleans family. The same day, however, he was created a Senator, and shortly afterwards returned to power as Minister of State. In this capacity he superintended the Paris Exposition of 1855 and the completion of the Palace of the Louvre. He remained one of the confidential ministers of Napoleon III. till December, 1860, when he was succeeded as Minister of State by Count Walewski. In November, 1861, he was reappointed Minister of Finance and held office until January, 1867. He died October 5th of the same year, at Tarbes. His three sons were all prominent in French politics.

FOUL IN THE FOOT. A contagious disease in the feet of sheep, characterized by ulcers and granulations. It is generally controlled and cured by applications of tarry substances. The name has been applied also to tubercular foot-rot, tubercular disease of the bones, and canker.

FOULIS, fow'lĭs, ROBERT (1707-76) and ANDREW (1712-75). Two eminent printers of Glasgow, brothers, whose names are usually classed together. Robert, the elder, for some time practiced as a barber—in those days a profitable and respectable profession. Having by his abilities attracted the notice of the celebrated Dr. Francis Hutcheson, then professor of moral philosophy in Glasgow University, he was advised by him to establish a printing-press. Accordingly he spent 1738 and 1739 in England and France with his brother Andrew, who apparently had been designed for the Church, and so had enjoyed a better education. In 1741 he started in business as a printer, his first publications being chiefly of a religious nature, and in 1743 was appointed printer to the university. In this year he published an elegant edition in octavo of *Demetrius Phalereus on Elocution*, supposed to be the first Greek work printed in Glasgow. In 1744 he brought out his celebrated immaculate edition of Horace, small 8vo, each printed sheet of which was hung up in the college at Glasgow, and a reward offered for the discovery of any inaccuracy. But, in spite of all efforts, six errors remained. Soon after he took his brother Andrew into partnership; and for thirty years they continued to bring out, particularly in the Latin and Greek classics, some of the finest specimens of correct and elegant printing which the eighteenth century produced, either in Great Britain or on the Continent. Among them were Cicero's *Works*, in 20 volumes; Cæsar's *Commentaries*, folio; Homer, 4 vols.; Æschylus; Herodotus, 9 vols., etc.; also an edition of the Greek Testament; Vergil; Gray's *Poems;* Pope's *Works;* a folio edition of Milton, and other publications in English. In all over five hundred and fifty publications came from their press. With the view of promoting the cultivation of the fine arts in Scotland, Robert Foulis, after a two years' visit to the Continent in preparation, commenced, in 1753, an academy at Glasgow for the instruction of youth in painting and sculpture. The expense attending this institution proved too great, and the printing business declined, but continued to be carried on till the death of Andrew, September 18, 1775. In 1776 Robert exhibited and sold at Christie's, Pall Mall, London, the remainder of his paintings, in the hope of recouping his broken fortunes; but after all expenses were defrayed the balance in his favor amounted to only 15 shillings. He died the same year at Edinburgh, on his return to Scotland.

For a catalogue of the publications of the Foulis brothers, consult: Duncan, *Notices and Documents Illustrative of the Literary History of Glasgow* (1831); also Tedder in *Dictionary of National Biography*, vol. xx. (London, 1889).

FOULK, George C. (?-1894). An American naval officer and diplomat. He was born in Pennsylvania in the early sixties and entered the United States Naval Academy at Annapolis at fourteen, graduated four years later at the head of his class, and as ensign served in the United States Navy on the Asiatic Station. In addition to the ordinary routine of his profession, he mastered the Japanese language and subsequently the Korean. He was detached in 1883, to serve as interpreter and secretary to the Korean Embassy, the first ever sent to Western countries. Arriving in Seoul in June, 1884, he was made naval attaché to the United States Legation and at Government instance made a journey through the country, publishing in the *United States Foreign Relations* his report. He enjoyed the confidence of the King and the progressive men, and on their behalf brought out military instructors and school-teachers from the United States, and aided in the formation of a stock farm and breeding station. Though foreseeing the political storm which broke December 4, 1884, he made a journey in the southern provinces, and after many dangers and hair-breadth escapes, he reached Seoul, acting as chargé d'affaires *ad interim* for 18 months, the youngest man ever intrusted with the duties of a Minister from the United States to a foreign country. Reentering the service of the Navy, he later resigned, married a Japanese lady, and became professor of mathematics in the Doshisha University in Kioto, where he died in 1894.

FOULKE, William Dudley (1848—). An American lawyer, civil-service reformer, and author, born in New York City. He graduated at Columbia in 1869, at the law-school of the university in 1871, was admitted to the bar in 1870, and practiced at New York City until 1876. Having removed to Richmond, Ind., he was there for fifteen years an attorney of the Pittsburg, Cincinnati, and St. Louis railway, and for one year (1883) an editor of the *Palladium* newspaper. About 1890 he retired from the bar. He was a member of the Indiana State Senate from 1882 to 1886; in 1885 introduced a bill to establish civil-service reform in Indiana, and subsequently organized and became president of the Indiana Civil-Service Reform Association. His investigations into the management of the State Hospital for the Insane revealed grave maladministration, due principally to the 'spoils' system. In the interest of the National Civil-Service Reform League, as chairman of a special commission, he also conducted in 1889-90 a series of investigations into the condition of the Federal civil-service. His publications include: *Slav or Saxon. A Study of the Growth and Tendencies of Russian Civilization* (*Questions of the Day*, No. 43, 1887); *Civil-Service Reform, Its Later Aspects* (*Economic Tracts*, No. 31, 1890); *The Present State of Our Civil Service* (printed with Warner's *The Silver Question*, in the *Publications* of the American Social Science Association, 1891); *The Theory and the Practice of Civil-Service Reform* (in the *Proceedings* of the annual meeting of the National Civil-Service Reform League for 1894); *Proportional Representation, An Address Before the Municipal League of Boston* (*Publications* of the League, No. 4, 1896); a biography (1898) of Oliver P. Morton, war governor of Indiana; and *Maya, a Story of Yucatan* (1900).

FOULLON, fo͞o'lôɴ' (often wrongly spelled Foulon), Joseph François (1717-89). A French administrator, and one of the earliest victims of the French Revolution, born at Saumur. He served as Intendant-General of the French Army during the Seven Years' War, and became in 1771 Intendant-General of Finance. Possessor of great wealth through marriage with the daughter of a rich Dutch family, he came to be in the popular mind the personification of all that was detestable, avaricious and hard-hearted, although he seems to have been really generous and sympathetic, and to have spent thousands of francs a year in giving employment to laborers on his estates at Viry. He was, however, active in furthering the measures for the defense of the Crown at the outbreak of the Revolution, and on July 12, 1789, was appointed Minister of Finance to succeed Necker. His task was not only thankless, but impossible of success. Threatened by the populace, he fled to his estates, but was overtaken and brought back to Paris. He was dragged through the streets with a bunch of hay stuffed in his mouth and a garland of thistles about his neck, and finally, in spite of the pleas of Lafayette, was hung to a lamp-post. Consult Chassin, *Les élections et les cahiers de Paris en 1789* (Paris, 1889).

FOUL PLAY. A romance by Charles Reade and Dion Boucicault, published in London, 1869. It was adapted for the stage and produced as a drama in six acts at the Holborn, in 1868, and in five acts at the Olympic, under the title of *The Scuttled Ship*, in 1877. The scene is laid partly in Australia and partly on an island in the Pacific.

FOUL WEATHER, Cape. See Cape Foul Weather.

FOUL-WEATHER JACK. A nickname given to the English Admiral John Byron (1723-1786), on account of his ill luck at sea, whether sailing or fighting. He was wrecked in the *Wager* (1740), and afterwards made a hazardous voyage around the world.

FOUNDATION (from Fr. *fondation*, Lat. *fundatio*, from *fundare*, to found, from *fundus*, bottom). The term foundation is employed to designate either the lower courses of a masonry structure or the prepared surface upon which this structure rests. In this article the prepared surface will be called the foundation bed, and the artificial structure above it will be called foundation structure, although there are many cases in practice in which this distinction cannot be adhered to strictly. The importance of foundation work in architecture and engineering hardly needs proof, for it is evident that upon the permanency and strength of its foundation depends the structural integrity of every building, bridge, or other structure. Probably no branch of engineering construction calls for more technical ability and practical skill than foundation work.

Foundation Soils. The preparation of the foundation bed and the load which it will sustain depend upon the nature of the foundation soil and its condition, particularly in respect to contained water. Foundation soils vary from hard bed-rock to almost liquid mud and silt. Solid rock is ordinarily the most perfect material upon which to build a foundation structure; but solid rock which disintegrates upon exposure to air or water may be a very unsatisfactory foundation soil. Generally speaking, however, bed-rock will carry safely almost any load which is likely to be placed upon it in ordinary work. Next to solid rock, sand and gravel form perhaps the best foundation soils, if they are so confined that they cannot spread laterally. Compact sand or clean gravel, in thick beds and confined from lateral movement, will sustain a load of from eight to ten tons per square foot. Clay soils vary from hard compact shales, which will carry almost any load, to soft, damp clay, which will squeeze out in every direction when heavily loaded. The stiffer varieties of clay, when dry, will carry a load of from four to six tons per square foot, but if wet will support scarcely half this load. Such soil as mud, silt, and quicksand have practically no sustaining power, and must be penetrated or removed until firm material is reached, or compacted by drainage or other means.

Hard-Soil Foundations. The construction of foundations on or in hard, stable sand, gravel, or clay soil is a comparatively simple task where they are above water-level. In rock the foundation bed is prepared by removing the loose stones and disintegrated rock, and roughly leveling off the surface. When crevices occur in the rock, they are filled with concrete, or if very wide are arched over, and if the natural surface is very much inclined, it is cut into steps like a staircase, instead of being leveled off at the elevation of the lowest point of the foundation area. The foundation structure is begun with a bed of concrete over the rock surface, and continued like masonry-work elsewhere. In hard soils the excavation is carried well below the frost-line, and its bottom is leveled off to receive the broad footing course of the masonry foundation structure.

Compressible-Soil Foundations. Foundation construction in compressible soils comprises first the artificial constructions necessary to reinforce the bearing power of the material, and second the building of the foundation structure. The supporting strength of the soil is reinforced in a variety of ways, but they can nearly all be classed under either pile foundations or platform foundations.

Pile Foundation. In its essentials a pile foundation consists of a group of piles sunk into the ground and carrying on their tops a platform of timber or concrete. Piles are either of timber or of iron. Iron piles are usually either screw piles or disk piles. A screw pile consists of a shaft, usually of iron, but sometimes of wood, having at its foot an iron casting provided with one or two turns of a screw, the blades of which vary from 1½ feet to 5 feet in diameter. In disk piles the screw blades are replaced by a circular iron disk. Timber piles are round tree-trunks with the bark removed and the knots and roughness dressed off. The method of sinking piles varies with their form. Iron screw piles are driven by screwing them into the foundation soil; timber piles are driven by means of hammers or the water-jet, and disk piles are driven by the water-jet. (See Piles and Pile-Driving.) The supporting power of piles is due either to their acting as a column whose lower end rests upon a hard structure, or to the friction of the earth upon the side of the pile, or to a combination of both of these actions. Various mathematical methods are employed for calculating this supporting power, which varies with the character of the soil and the depth of the pile. At best the supporting power of piles can only be approximated, and it is customary to load them only to a fraction of their supporting power in order to avoid chances of failure. The number of piles to be used in any particular foundation will depend upon the weight to be supported and other load conditions, but it is seldom practicable to drive them closer together than 2½ feet to 3 feet apart. After being driven, the tops of the various piles are cut off to a common level, and they are ready for the construction of the platform or capping. If a timber platform is used, it usually consists of one or more courses of timber fastened to the tops of the piles and planked or floored over. If concrete is employed, the earth is leveled off a few inches below the tops of the piles, and the spaces filled with a layer of concrete which is carried up thick enough to cover the tops of the piles several inches. The foundation structure is built on the top of the platform.

Platform Foundations. The principle of the platform foundation is that of distributing a concentrated load over a large area by means of a platform or raft-like structure. Platform foundations are built of masonry, of masonry and metal combined, and of timber. A stone or brick masonry platform foundation consists of a series of inverted arches sprung between the supporting piers or columns. Concrete masonry platform foundations consist of a layer of concrete, of sufficient thickness not to break by bending, deposited over the foundation area. Timber platform foundations consist of two or more layers of timbers spiked together and covering the foundation area. Concrete and steel platforms consist of one or more layers of steel I-beams, railway rails, etc., imbedded in a layer of concrete. Platform foundations are extensively employed for founding buildings on soft ground.

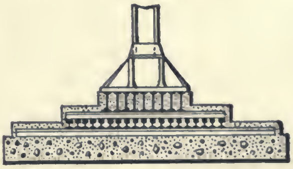

Fig. 1. COLUMN FOUNDATION OF STEEL RAILS AND I-BEAMS IMBEDDED IN CONCRETE.

Subaqueous Foundations. Specifically, subaqueous foundations are those constructed on or beneath the bed of a stream or other body of water. Broadly speaking, however, subaqueous foundation processes must generally be employed in all places where the conditions necessitate that the foundation bed shall be below the water-level. The principal subaqueous foundation processes are: (1) the cofferdam process; (2) the crib and open caisson process; (3) dredging through wells; (4) the pneumatic caisson process; and (5) the freezing process.

Cofferdam Process. A cofferdam (q.v.) is an inclosure from which the water is pumped out, and in which the masonry is laid in the open air. The construction of cofferdams varies considerably. In still, shallow water a bank of earth surrounding the foundation area is often employed, or a similar wall of bags of clay, barrels of sand banked on the outside, etc. More generally, however, a double row of sheet piles with the space filled between with rammed clay and earth is built around the foundation area. Cofferdams are limited to works in comparatively shallow water, and where no very great depth of excavation is necessary to reach a good foundation bed. They are particularly adapted to foundations in water-bearing soils on land.

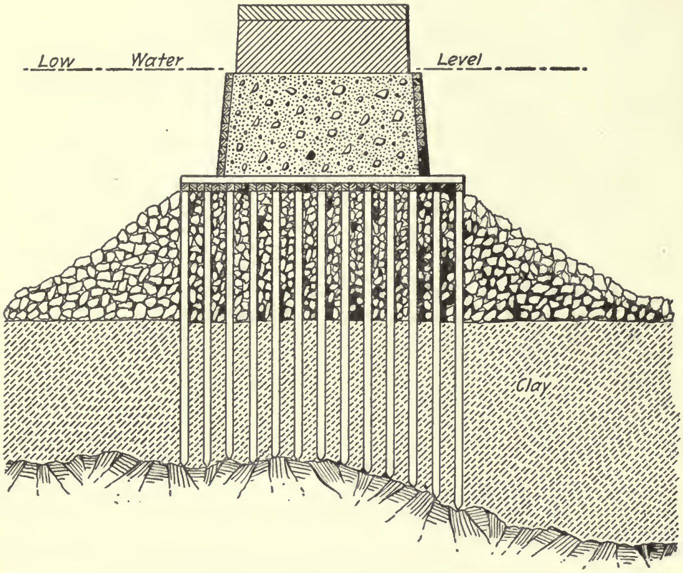

Fig. 2. PILE AND CRIB FOUNDATION FOR A BRIDGE PIER.

Crib and Open Caisson Process. This process consists in building the masonry in a box-like structure open at the top, which sinks as the masonry is added until it rests on the foundation bed. The foundation bed may be prepared by dredging the bottom until solid material is found, or by driving piles which are cut off at a common level below water. As usually constructed, the bottom of the open caisson consists of one or more courses of timber bolted together, like the timber platform for a pile foundation. The sides of the box or open caisson are also constructed of timber so arranged that they are water-tight. When the caisson has been grounded and the masonry completed, the sides of the caisson are removed. The bottom of the caisson which remains in the foundation structure is usually called the crib. Often where crib and open-caisson foundations are sunk onto solid rock beds with an irregular surface, this surface is carefully determined by soundings, and the bottom of the crib is so fashioned that it fits these irregularities.

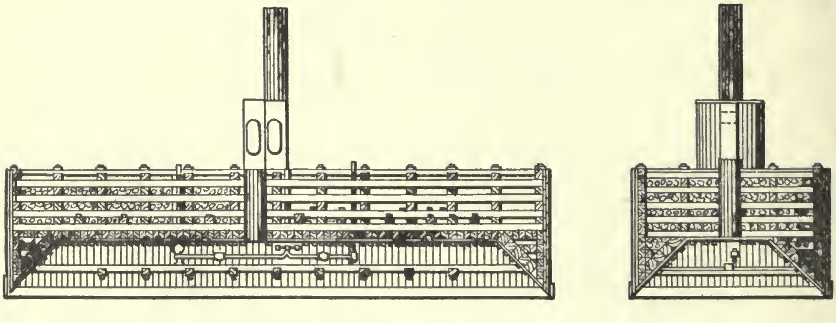

Fig. 3. PNEUMATIC CAISSON FOR FOUNDATION OF A BRIDGE PIER.

Dredging Through Wells. Foundations constructed by dredging through wells usually consist of timber cribs or metal cylinders sunk by dredging through interior wells or the inside of the cylinder, and thus undermining the foundation, which may be sunk to very great depths.

Pneumatic Caissons. Described without technicalities, a pneumatic caisson is a water-tight box of timber or metal sunk bottom up or with its open side down. On top of the upturned bottom is built another box open at the top in which the masonry is built. The method of sinking is as follows: The lower box, or the caisson, is towed into position over the foundation site, and masonry is built inside the upper box until the edges of the lower box penetrate into the stream-bed. Air under pressure is then forced into the lower box, expelling the water underneath it, and men can then work underneath as in a diving-bell. (See Diving.) These men excavate the earth, which is taken out through the top of the caisson, the caisson sinking deeper and deeper as the excavation proceeds until solid rock or other suitable hard material for a foundation bed is encountered. Concrete is then lowered into the caisson and the entire space filled with it. The upper box is then removed, leaving the masonry carried on the caisson filled with concrete. This is one of the most valuable methods of subaqueous foundation construction.

Freezing Process. This process of foundation construction has been used in comparatively few instances, and always in sinking through water-bearing soil. Its operation is as follows: A row of tubes surrounding the site is sunk into the water-bearing material, and a freezing-liquid is forced into them until the surrounding material is frozen. The frozen material is then excavated and the masonry is built, after which the tubes are removed, and the ground is allowed to thaw out.

Notable Examples of Foundation Work. In the preceding paragraphs the various methods of constructing foundations have been very briefly described. To illustrate the application of these methods in actual work, a few notable examples of foundation construction will be described.

New East River Bridge. The four suspension cables for this structure are carried by steel towers resting on masonry pedestals founded on pneumatic caissons. Each tower has two groups of four legs each, and each group of legs is carried by a separate pedestal and caisson foundation. The caissons for the Brooklyn tower were built of timber, and were 63 × 79 feet each in plan. They were sunk 97½ feet apart, centre to centre, and with their longer sides parallel. Each structure consisted of a caisson proper and a cofferdam surmounting it, the whole forming a rectangular box 63×79 feet, with a solid flooring placed 7½ feet above the bottom edges. The space between the walls below this floor formed the compressed-air working chamber, and the space above it to the top of the caisson was filled with timber cribwork, with suitable wells left for exit from and entrance to the working chamber. The caisson for the south pier or pedestal was sunk to the greatest depth, about 107½ feet below water-level, which, with one exception, is the greatest depth to which a pneumatic caisson foundation has ever been sunk. After sinking, the entire working chamber and all the open spaces in the caisson proper were filled with concrete. The stone masonry of the pier began on top of the caisson. As indicating the quantities of material and amount of work required in this tower foundation, the following figures are significant:

QUANTITIES	South caisson	North caisson
Timber, cub. ft.	58,800	74,700
Iron, tons	86	98
Concrete, yds	5,140	7,245
Stone masonry, cub. yds	7,755	7,755
Sand excavation, yds	3,400	4,000
Clay, yds	2,233	4,170
Rock, yds	390	940

The following figures give the principal dimensions and other significant general dates of a few other important pneumatic caisson bridge foundations:

NAME OF STRUCTURE	Lateral dimensions, feet	Material	Area, sq. ft.
Third East River Bridge	78 × 144	Timber	11,232
Alexander III. Bridge, Paris	144 × 110	Steel	15,860
New York and Brooklyn Bridge	168 × 102	Timber	17,136
Havre de Grace, Maryland	78.2 × 42.3	"	3,307
Eads Bridge, Saint Louis, Mo.[1]	64 × 48	"	3,072
Forth Bridge, Scotland[2]	70	Iron	3,848

Hawkesbury Bridge. The bridge over the Hawkesbury River in Australia was founded by dredging through metal cylinders. The cylinders, or rather ellipses, were 48×20 feet in diameter, and the dredging was done through three tubes which terminated at their bottoms in bell-mouthed extensions which met the cutting edge of the elliptical shell. The space between the dredging-tubes and the outer shell was filled with gravel as the sinking progressed. The material penetrated was mud and sand and the foundation bed of hard gravel was reached at a depth of 185 feet below high water. The shell was filled to low water with concrete and above with cut stone masonry.

Poughkeepsie Bridge. The bridge across the Hudson River at Poughkeepsie, N. Y., was founded by first sinking timber cribs, by dredging through interior walls, and then sinking an open caisson on top of the crib. The largest crib sunk was 100 feet long, 60 feet wide at the bottom, 40 feet wide at the top, and 104 feet high. It was divided by one longitudinal and six transverse walls into 14 compartments. The outer walls and the longitudinal interior wall were made wedge-shaped and solid for a height of 20 feet and above that they were hollow. The gravel used to sink the crib was deposited in these hollow walls. The dredging was done through the 14 interior compartments, and when hard bottom was reached at a depth of 134 feet the pockets were filled with concrete.

Kingsbridge Power-House. In constructing the power-house for the Third Avenue Railway in New York City, a pile foundation with a concrete platform was constructed having lateral dimensions of 256⅓×319⅓ feet. At the site of the foundation a bed of fine sand overlaid solid rock at a depth of over 100 feet. A cofferdam of sheet piling was constructed entirely around the foundation. The bearing piles were driven 2 feet and 4 inches apart under the boiler-house and 2 feet 6 inches apart under the engine-house. This spacing refers to the piles inside the first row around the entire building. The piles in this first row were driven close together and with a slight slant outward and downward. This arrangement was adopted to aid the sheet piling in confining the sand. The inner bearing piles were all driven vertically by the water-jet. The tops of the piles were cut off at a uniform level of 6 inches above the bottom of the excavation, and were capped with a layer of concrete 7½ feet thick or 7 feet thick above the tops of the piles. This concrete cap was a solid monolithic structure.

Auditorium Hotel. The Auditorium Hôtel in Chicago rests on a platform foundation consisting of a timber platform 2 feet thick covered with a layer of concrete 5 feet thick; in the concrete are imbedded three layers of railway rails, a layer of V-beams, and a layer of I-beams. The area of the foundation is 60,000 square feet.

Tall Buildings. The Fair Building in Chicago is notable as presenting one of the most typical examples of the steel and concrete floating foundation so extensively used in that city and elsewhere. The framework of the building is carried by 46 columns. The foundations of these columns consist in each case of, first 18 inches of concrete on top of which are laid, cob-house fashion, three layers of railway rails, the interstices between which are filled with concrete. Each succeeding layer of rails has smaller lateral dimensions than the preceding layer, so that the structure is pyramidal in form. On top of the third layer of rails is placed a layer of rolled I-beams, filled between and outside with concrete, and on these I-beams rests a cast-iron pedestal. The total depth of the foundation structure exclusive of the pedestal is about 4 feet. Some of these foundations carry a single column and some carry two columns, and their lateral dimensions vary with the number of columns carried and with the loads on the columns. Nearly all of the tall buildings of Chicago have foundations of this general construction. The Broad Exchange Building in New York City is founded on pneumatic caissons sunk to hardpan. The framework of the building is carried by 100 columns and the foundations were designed upon the general plan that each column should have its individual caisson foundation. All the caissons except those located along some of the party walls are cylindrical and carry the columns concentric with their tops. The party wall caissons are rectangular, with their longer sides parallel to the wall. The cylindrical caissons vary from 7 feet to 9½ feet in diameter, the greater number being of the smaller size. They are filled with concrete to the top and most of them have a granite coping the full size of the caisson. All the caissons were made of steel plate and were sunk by the pneumatic process.

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[1] This caisson was sunk to a depth of 109 feet 8½ inches below water. [2] Four cylindrical caissons of this diameter were employed for each of the two main piers.

The preceding paragraphs give only a bare outline of foundation construction, the great variety of methods and conditions of such work making a full treatment possible only in special treatises. Among the best books on foundation construction, consult: Patton, *A Practical Treatise on Foundations* (New York, 1893); Baker, *A Treatise on Masonry Construction* (New York, 1900); Fowler, *The Cofferdam Process for Piers* (New York, 1898). Many of the best descriptions of foundation work are found in the engineering journals and the publications of the various engineering societies.

FOUNDER (from ME. *foundren*, to founder, from OF. *fondrer*, to sink, from *fond*, Lat. *fundus*, bottom), or LAMINITIS. Inflammation of the vascular sensitive laminæ of the horse's foot. It is rarely met with in cattle or sheep, owing to the corresponding structures being in them much less developed. Occasionally the laminæ are strained from severe exertion; more frequently they suffer from the morbid effects of cold, which is especially injurious after the excitement and exhaustion of labor. Very commonly also they become inflamed from their close sympathy with diseases of the digestive organs, often following engorgement of the stomach, or inflammation of the bowels. All four feet are sometimes affected, more usually the fore pair only. The feet are hot and tender; the animal stands as much as possible upon the heels; trembles and groans when moved; and is in a state of acute fever and pain. Except when following superpurgation or internal disease bleeding is useful. The shoes must at once be removed, and the toes, if long, reduced, but no further rasping or cutting is permissible. The affected feet should be kept in a tub of water at a temperature of 45° F., or wrapped in cloths wet with cold water. Soap-and-water clysters, repeated if necessary every hour, usually suffice to open the bowels, which are very irritable. Physic, if required, must be used with extreme caution. Two drams of aloes is an ample dose in cases of founder. The strain should be taken off the inflamed laminæ by getting the animal, if possible, to lie down, or, where this is impracticable, by suspending or supporting him in slings. When the inflammation continues so long that serum and lymph are poured out between the sensitive and horny laminæ, free exit for the same must be provided by making an opening through the toe with a small drawing-knife. This may prevent the pumiced and disfigured feet that are apt to follow severe and repeated attacks. After the acute symptoms pass, cold applications to the feet and a mild blister round the coronet help to restore the parts to their natural condition.

FOUNDER OF PEACE. A title given to Saint Benedict.

FOUNDERS AND PATRIOTS OF AMERICA, ORDER OF. An hereditary patriotic society organized in New York City in 1896. The objects of the Order are the association of those whose ancestors struggled together when the United States was a new country; the teaching of a reverent regard for the character of the founders of the country; and the preservation of records relating to the first colonists, their ancestors and descendants. The society admits to membership lineal descendants of an ancestor who settled in any of the colonies prior to May 13, 1657, and whose subsequent ancestors were loyal to the cause of independence. The National Society consists of representatives of the State societies in New York, Pennsylvania, Connecticut, New Jersey, and Massachusetts, and holds its annual meetings on the anniversary of the settlement of Jamestown. The membership is upward of 450.

FOUNDING, or METAL-CASTING. The art of forming in loam or sand a mold of any given design which is subsequently filled with molten metal and allowed to solidify. The resultant casting is a copy in metal of the design or model furnished. The place in which these operations are performed is called a foundry. Foundries are distinguished by either the metals employed or the class of castings made, as iron, steel, brass, statue, type, bell foundries, etc. The variations of working in founding are so numerous that it is possible here to describe even briefly only the general process of iron-founding and a few more important special processes for producing certain kinds of castings.

IRON-FOUNDING may be divided into three operations: (1) The making of the mold; (2) the melting of the metal; and (3) the pouring of the molten metal into the mold. The making of the design or mold, which is usually called the pattern, is not strictly a part of founding, although in most instances foundries have pattern-shops working in conjunction with them as a part of the same plant. Wood patterns are by far the most numerous, although other materials are also used. The molding is usually done in sand or in loam; the great bulk of commercial iron castings being produced in sand molds. Every mold must consist of at least two parts in order that the pattern may be removed. When the desired casting is of complicated form the pattern is usually made in several pieces so joined that they may be removed one at a time. The process of molding in sand, using flasks, is, briefly stated, as follows: The lower flask, called the drag or swivel, is filled with sand and the lower half of the pattern imbedded in it. The upper flask is then placed in position on the lower, and sand is rammed tightly around the upper half of the pattern. The pair of flasks is then turned bottom up and the sand, first loosely placed in the drag, is removed and replaced by firmly packed fresh sand. The pair of flasks is then reversed to their original position, and they are parted along the line of juncture, the pattern remaining in the drag and the mold of its upper part remaining in the upper flask or cope. After removing the pattern from the drag and finishing up the imperfections in the mold by hand the two flasks are again placed in position and the metal is poured through suitably formed holes or gates. The mode of procedure just described is greatly varied in detail, but its essentials remain the same. For example, the bottom flask is often dispensed with, the lower half of the mold being formed or 'bedded in' the sand floor of the foundry, while the upper half of the mold is formed in a flask or cope, as when a pair of flasks are employed. Often also the pattern is parted at the middle, one part remaining in the drag and one in the cope to be separately removed. If the casting is to be hollow, a core of the proper form is suspended in the mold previous to restoring the cope to its position on the drag. These cores are commonly built up on iron coils and are coated with sand. Two varieties of sand-molding are employed: green-sand molding and dry-sand molding. The essential difference is that in dry-sand molding the flasks, after the mold is finished, are placed in a drying-oven and thoroughly dried. Molds in dry sand admit of exceedingly large and intricate castings being made with much less risk than in green sand.

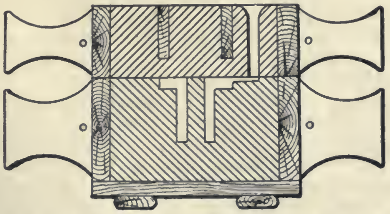
FIG. 1. SECTION OF FOUNDRY FLASK AND MOLD.

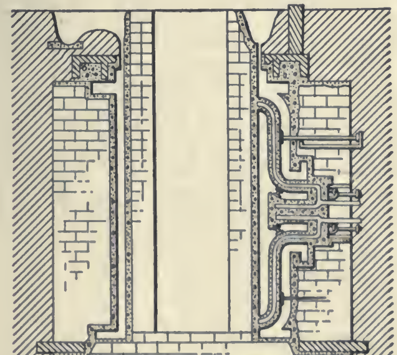
FIG. 2. SECTION OF MOLD ARRANGED FOR CASTING A STEAM ENGINE CYLINDER.

Loam molding differs from sand molding in that the molds proper are not contained in flasks or bedded in the floor, but are constructed in sections composed of rings, plates, and brickwork. To illustrate loam molding the comparatively simple process of casting a cylinder will be described. A hollow core of iron or brick is first erected and plastered outside with a layer of loam—mixed sand and clay—to the exact inside dimensions of the cylinder. When the loam coating is dried it is washed with a mixture of charcoal and water. A layer of loam is then added, which is laid on and finished off to the exact thickness and exterior form of the cylinder to be cast. This is then dried and washed, as was the core. Around this thicknessing, as it is sometimes called, is built a shell of brickwork a few inches larger than the thickened core, and the annular space is rammed full of loam. When dried, this shell is lifted by a crane and the thickening removed from the core. The shell or cope is then replaced, and there is an annular space left between it and the core, exactly the dimensions and shape of the thickening. This space is the mold into which the molten metal is poured. This is almost exactly the process of bell-casting. See BELL.

The iron is melted in a cupola, or foundry furnace, which consists essentially of a short iron cylinder mounted on iron columns and lined with fire-brick, and of a belt or wind-box surrounding the cupola near the bottom, and from which several pipes or nozzles, called tuyeres, extend into the cupola to give entrance to the air-blast. Cupolas vary in diameter from two to ten feet. They are cylindrical for a portion of their height, and then conical, to form a chimney. At the top of the cylindrical portion is placed the charging-hole, and at the bottom are one or two breast-holes for raking out the cinders, and a tap-hole through which the molten metal is drawn. The molten metal is run into ladles, which are iron vessels lined with some refractory substance, and provided with a lip for directing the metal into the mold in pouring.

The preceding paragraphs describe very briefly the general process of making iron castings; the following are the special methods adopted in making certain forms of castings which are used in large quantities, such as car-wheels, cast-iron water-pipe, kettles, ordnance, and statuary. The casting of car-wheels varies from the general process described only in having an iron ring for that portion of the mold which forms the tread. This iron ring has the effect of suddenly cooling the metal forming the tread and thus rendering it more dense and hard. This hardening process is called chilling, and is employed in making rolls and other articles which require a hard wearing surface. Water-pipe is cast vertically in cast-iron casings having the core on a barrel. The pattern is inserted in the casing and the annular space between it and the casing is rammed full of sand. The pattern is then removed and the core inserted in its place. In casting kettles, the core corresponding to the inside of the kettle is molded bottom up on a bare plate. A thickening of sand of the exact thickness and exterior form of the kettle is then added to the core. A cope is then built around the thickened core, and when dry is removed to allow the thickening to be broken away, after which it is replaced and the metal poured. All cast-iron hollow ware, pots, pans, etc., are cast in substantially the same manner.

Statue-founding is much similar, except that the thicknessing of the pattern in bronze-casting is made of wax, which is melted out by heat without lifting the cope. Small statuary casts of lead, tin, zinc, and their alloys are made by pouring the metal into iron molds and, after due time has been allowed for a skin to congeal on the surface, inverting the mold, and allowing the molten inside metal to run out. Iron statues are founded like kettles or bells, with a core thicknessing of sand or loam and with the cope made in sections to permit removal. Type is cast in metal molds at the ends of which is the matrix for forming the letter. In modern type-foundries the process is a mechanical one performed automatically by type-casting machines.

Cast ordnance is now seldom made, but the process of producing such castings calls for a brief explanation. Bronze and cast-iron cannon are cast in loam molds. The founding of a Rodman gun, which, while now obsolete, is the most recent form of cast gun (see ORDNANCE), is as follows: The mold is of dry sand contained in circular sectional casings. The chief feature is the core barrel, which consists of a water-tight cast pipe or barrel with flutes on its exterior surface along its whole length to permit the gas to escape upward from behind the hemp and loam with which the barrel is coated. After the mold has been closed together, the barrel is attached to a spider or tripod, the legs of which rest upon the top flange of the casing; adjusting screws at the end of each leg permit the accurate centring of the core in the mold. A pipe extends down the centre of the core, through which water is forced and escapes by rising through the annular space between the pipe and the inside of the core. The purpose of this process is to cool the gun-casting from the inside outward. In casting a 15-inch gun the water-pipe and core are removed in about twenty-four hours, and afterwards a current of cool air is forced into the bore of the gun, which is cool enough to remove from the mold in about nine or ten days.

These few examples of the many different methods of founding will give a very fair notion of the art. In closing, a word may be said about molding-machines. They are made in a great variety. One of the most important classes comprises machines for molding cast gear-wheels. For a full description of founding processes and tools, consult: Bolland, *The Iron Founder* (New York, 1892); id., *The Iron Founder Supplement*, and id., *Encyclopœdia of Founding* (ib., 1893); West, *American Foundry Practice* (ib., 1882); id., *The Molders' Text Book* (ib., 1886); Dingey, *Machinery Pattern-Making* (ib., 1892); Sharp, *Modern Foundry Practice* (ib., 1900).

FOUNDLING, THE. A play by Edward Moore (1748). The plot is based on the false report of the death of the foundling, Harriet Raymond, who in reality, under the name of Fidelia, was sold to a villain, and finally rescued by Charles Belmont, who marries her.

FOUNDLING HOSPITAL or ASYLUM. An institution for the care of children, particularly infants that have been abandoned by their parents or guardians. In modern times the great majority of children in foundling hospitals are not foundlings, but are (1) illegitimate children brought to the institution by the mothers or their friends; (2) legitimate children whose mothers, because of desertion of husband, poverty, or other causes, feel unable to care for them; and (3) a few orphans.

The first foundling hospitals were introduced by the Church to prevent infanticide. In the sixth century the Bishop of Treves permitted children to be placed in a marble basin before the cathedral, with the understanding that members of the church would care for them. The capitularies of the Frankish kings mention foundling hospitals. The first well-authenticated establishment was founded at Milan in A.D. 787, the Council of Nicæa in that year having ordered that each city should have an institution for abandoned children. A foundling hospital was organized at Montpellier in 1070; Einbeck, 1200; Rome, 1212; Florence, 1317; Nuremberg, 1331; Paris, 1362; Vienna, 1380. For the care of children above the age of infancy, see DEPENDENT CHILDREN.

The number of foundling hospitals in France was greatly increased through the labors of Saint Vincent de Paul and of Colbert in the seventeenth century. After 1789 the French Republic assumed the charge of foundlings. The children were at first publicly received, but by a decree of 1811 there was introduced into foundling hospitals throughout the Empire a revolving cradle-'tour,' so arranged that the person who deposited a child in the cradle could not be seen from within. The person was then able to turn the cradle so that the child would be brought within the institution. This was introduced on the ground that thereby child-murder would be lessened. Whether infanticide was materially decreased is not known, but the unexpected and immediate effect was a great increase in the number of children abandoned. The number left at foundling hospitals in 1784 is stated to have been 40,000; in 1815, 68,000; and in 1834, 134,000. Other countries had similar experiences. In 1834 a Parliamentary commission reported that the influence of the *tour* was pernicious; and it was gradually abolished. With the abolition of the tour a marked decline in the number of foundlings took place.

At present the public foundling hospital in France serves merely for the temporary care of the infants. Every attempt is made to discover the identity of the mother. If found, persuasion is employed to induce her to take back the child; if she is in need of support, public aid is promised her. When the mother cannot be found, or if she will not take the child back, a place is found for it in a private family, where it is nursed and cared for during the period of infancy. A similar system is in vogue in some of the German cities, notably Leipzig. This system has not only greatly diminished infant mortality, but has very materially diminished the number of children abandoned.

In Vienna foundlings are cared for in a hospital. Mothers who wish to leave children in the institution are required to serve in the hospital as nurses for a period of three months. The system provides for the nursing of children whose mothers are not found. Moreover, after caring for her child for so long a period of time, the mother is less inclined to leave it if it is possible for her to keep it. The system has been found to yield very satisfactory results.

About 1741 the Foundling Hospital of London began to receive children. It was established by Thomas Coram, a benevolent sailor, who donated 56 acres of land, which now yield in annual rents more than the original purchase price of £5500. At first applications for admission were so numerous that the children admitted had to be chosen by lot. Fifteen years later Parliament gave financial assistance, and all the children deposited in a basket outside the gate were cared for. This system led to such serious abuses that the authorities decided to take charge of only those children who were accompanied by the sum of £100. In 1801 the present form of organization was adopted. A child is admitted only after a careful personal examination of the mother has shown that it is illegitimate and the first born, and that the mother has never lived with the father. Preference is given in cases where the mother has been deceived by a promise of marriage. The hospital is rich and well managed, and takes good care of its foundlings.

In America the county poor farm was the only place at first provided for foundlings. In some places there is still no other public provision. Foundling hospitals, however, are now to be found in all the larger cities. Nearly, if not all, the foundling hospitals are under private management, but many of them receive subsidies from public funds. 'Baby farms' is the name applied to those places where babies are boarded for the sake of the gain. They exist in most of our cities. They are not incorporated, are subject to no supervision or control, though they frequently solicit donations on the plea of charity. They are productive of frightful abuses and should be prohibited.

The death-rate in foundling hospitals frequently ranges from 90 per cent. to 100 per cent., and an average of 75 per cent. is common. The New York Infants' Hospital lost 98 per cent. of its foundlings in 1895, 99 per cent. in 1896, and 100 per cent. in 1897. "Twenty-eight infants were consigned one after another by a public official to a private institution and they all died." The experience of European institutions is identical. The better institutions now recognize this evil and seek to avoid it by having the mother who wishes to leave a child in the institution stay and nurse it and another child also if possible. In the Chicago Foundlings' Home, where this rule is practically enforced, the death-rate is very low. Where this plan is impracticable, the New York Foundling Asylum and others have adopted the plan of placing the infants at board in selected private families. Those receiving the children must comply with the detailed rules of the institution. Medical care is furnished, and a careful system of visitation is maintained. The children are later recalled to the institution, and are finally placed in homes.

Another objection to the present system is that the preliminary investigations are insufficient, so that many children are received who are not properly subjects for charity. Very few foundling hospitals make any further investigation than to question the one bringing the child.

In Massachusetts foundling hospitals have been abolished by law. It is forbidden to board more than two infants under two years of age in any family unless that family has a license given after thorough investigation, the license stating the number of children allowed. The State Board of Charities has a department for the children, who are boarded out in families. Since the abolition of the foundling hospitals the death-rate has decreased 12 per cent. In 1898 the foundlings from the New York Infants' Hospital were boarded out. The death-rate of those boarded fell to 55.9 per cent. immediately, and later to 31.1 per cent.

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FOUNDRY. See FOUNDING.

FOUNTAIN (OF. *funtaine*, *fontaine*, Fr. *fontaine*, from ML. *fontana*, from Lat. *fons*, spring; connected with Gk. χεῖν, *chein*, Skt. *hu*, to pour, AS. *gēotan*, Icel. *giota*, OHG. *giozan*, Ger. *giessen*, to pour). A place where there is a continuous flow of fresh water into either a natural or an artificial basin. In southern and eastern countries, where water is of especial importance, not only has great care always been taken to insure its plentiful supply, but this importance has been recognized by beauty of architectural and sculptural decoration. In the ancient world another incentive was added—religious devotion to the water deities, to water nymphs, to gods of curative mineral sources. The earliest preserved example is a large stone basin carved in relief with figures, found in the royal palace at Tello. This Babylonian fountain dates from B.C. 3000. Next is the Assyrian fountain at Bavian, sculptured in the face of the rock itself, where two affronted lions rest their fore paws on the mouth of a vase from which the water spouts into a series of basins cut in the rock and descending to the stream, the lions being at the lowest basin. Ancient Greek fountains of any size were usually inclosed. There was no aquatic display, but the water was gathered into basins under cover, while above these rose ædiculas or columns decorated with statues and even colonnaded porticoes under which one descended by stairs to the fountain itself. Smaller Greek fountains were of various kinds. Those standing at street corners had rectangular or circular basins with a spout, and were uncovered. Numerous road fountains belonged to the same class. Others were free-standing, with water spouting from the mouths of lions or boars set in the upper part of a central column through which the water-supply was carried. Many such fountains are represented on Greek vases, but none remain. Recent excavations by the American School of Classical Studies under Professor Richardson have brought to light one of the largest and most famous of Greek fountains, that of Pirene at Corinth, mentioned by Herodotus and restored by the Romans. It was formed of white stone, and contained a number of cells from which the water flowed into an open basin. The city of Corinth possessed many other fountains. In one near the statues of Diana and Bellerophon the water flowed through the hoofs of the horse Pegasus. The Fountain of Glauce, inclosed in the Odeum, was dedicated to Glauce because she was said to have thrown herself therein, believing that its waters would counteract the poisons of Medea. Another Corinthian fountain had a bronze statue of Neptune standing on a dolphin from which the water flowed.

The fountain constructed by Theagenes at Megara was remarkable for its size and decorations, and for the number of its columns. One at Lerna was surrounded with pillars, and the structure contained a number of seats, affording a cool summer retreat. Mystical medicinal, surgical, and other qualities, as well as supernatural origin, were ascribed to fountains, and they were often connected with temples and shrines. Salt springs were sacred to Poseidon; many curative springs to Æsculapius and Hygieia. One at Cyanæ, in Lycia, was said to possess the quality of endowing all persons descending into it with power to see whatever they desired to see; while the legends of fountains and other waters of strange power to heal are numerous in many lands. The famous Enneacrunos fountain at Athens was called Callirrhoë before the time the water was drawn from it by the nine pipes from which it took its later name. Two temples were above it, according to Pausanias, one dedicated to Demeter and Proserpine, and the other to Triptolemus. The fountain in the Temple of Erechtheus at Athens was supplied by a spring of salt water, and a similar spring supplied that in the Temple of Poseidon Hippias at Mantinea. Above the Heræum of Argos, the centre of Argive worship, was the famous Asterion Fountain. Often the Greeks made rock excavations to capture the water at its source. Among the most notable of these were that near Syllium in Pamphylia, which still remains; that near Larnaka in Cyprus; and the Burinna Fountain near Cos, covered with a dome. Among the famous fountains consecrated to Apollo were the Castalian fountain and the Cassotis at Delphi, connected with the oracle; vapor and gas in the water contributed to the cult.

The water-supply of Rome and the works auxiliary to it were on a scale to be expected from a people of such great practical power. The remains of the aqueducts which stretched from the city across the Campagna are among the most striking monuments of Italy. The aqueducts supplied the baths and the public fountains, from which last all the populace, except such as could afford to pay for a separate pipe to their houses, obtained their water. These fountains were therefore of large size and numerous. They were formed at many of the castella of the aqueducts. According to Vitruvius, each castellum should have three pipes—one for public fountains, one for baths, and a third for private houses. When Agrippa reorganized under Augustus the city's water-supply, he made or restored 700 fountains, decorating 400 with marble columns and 300 with statues of marble or bronze. The Roman fountains, called *salientes,* were generally decorated with figures and heads. A beautiful marble rhyton at Rome (Palazzo dei Conservatori), a Silenus holding a skin, a Triton with shells, river-gods reclining on rocks, are some of the numerous forms of decoration. These and similar ones belong mostly to the *free-standing* as distinguished from the *niche* class. Fountains were often also the ornament of Roman villas and country houses; the water generally fell from above into a large marble basin, with at times a second fall into a still lower receptacle. Not the least interesting of the Pompeian discoveries are the public and private fountains. The public fountains were comparatively simple and of rectangular shape, as were also the public fountains found at the corner of the forum of Thamugadi (Timgad in Algeria), and at Cuiculi (modern Jemila); but the private Pompeian fountains were of rich and varied shapes, usually of mosaic cubes and shellwork and in the form of a niche. Especially interesting are those of the Casa della grande fontana and the Casa della piccola fontana a mosaico, and those of the Casa del Centenario and of the Casa di Lucrezio. In 1880-81 a particularly beautiful one was found, decorated with a statuette of Silenus and with mosaics of the Birth of Venus and the Bath of Venus and the Loves. The public fountains of Pompeii had little ornament except a human or animal head, from the mouth of which it was arranged that the water should issue. Not only did simple running fountains exist, but the remains of *jets d'eau* have been found; and a drawing exists representing a vase with a double jet of water, standing on a pedestal placed in what is supposed to have been the impluvium of a house. There was also a *jet d'eau* at the eastern end of the peristyle of the Fullonica at Pompeii. The Romans were from the earliest times quite as devoted as the Greeks to the cult of sacred springs and their deities, such as Juturna, Picus, and the nymph Egeria, whom legend made the inspirer of King Numa. The discoveries of votive offerings at mineral and other springs show the cults to have been continuous from the Royal to the Imperial period.

As among the Greeks and Romans, so with the early Celts and other northern tribes, traces of superstitious beliefs and usages with relation to fountains can be traced in monumental and legendary remains. At Lochrist, beneath the church, and at the foot of the hill upon which it is built, is a sacred fountain, near which is erected an ancient chapel. Miraculous virtues are yet attributed to its water, and on certain days the country people still come with offerings to draw it. In the enchanted forest of Brochelande, famous from its connection with Merlin, was the fountain of Baranton, said to possess miraculous characteristics. The Christian missionaries could not easily overcome beliefs so planted in the hearts of the people, and so strengthened by daily practices. By a wise policy, practiced by the Christian Church everywhere during the stage of conversion, finding themselves unable to eradicate the superstitions which ascribed miraculous power to rocks and woods, streams and fountains, connected with the divinities of the old religions, the evangelists changed their form and direction by dedicating these objects to the Virgin and saints, so making the force of the old belief an instrument for its own overthrow. Fountains were attached to the new religion by the erection of statues of the Virgin or of saints upon the possibly rude structures that collected the water and preserved its purity. There is some uniformity in the architectural characteristics of these structures during the Middle Ages. A very common form in rural districts was that in which the fountain was reached by descending steps. A large basin received the water, sometimes from a spout, but often from the spring itself. This basin was covered by a sort of porch or vault, with, at times, molded arches and sculptured figures and escutcheons. On the bank of the Clain, at Poitiers, is a fountain of this kind, the Fontaine Joubert, which, restored in 1597, was originally a structure of the fourteenth century, with a niche, bench, and stairs descending to the basin. Many such fountains are found in Brittany, and, indeed, throughout France, and the great antiquity of some of them is proved by the superstitions regarding them which still exist among the peasantry. A form more common in populous districts was that of a large open basin, round, square, polygonal, or lobed in form, with a columnar structure at the centre, from the lower part of which it was arranged that spouts should issue, playing into an open basin, and supplying vessels brought for the purpose in the cleanest and quickest manner. The columns take very varied forms, from that of a simple, regular geometrical solid, with only grotesque masks at the spouts, to that of an elaborate and ornate Gothic structure, with figures of virgins, saints, and warriors, with moldings, arches, crockets, and finials. At Rouen the Pucelle Fountain (fifteenth century) has an elaborately sculptured pinnacle. The most exquisite of all Gothic fountains is in Germany, the Schöne Brunnen at Nuremberg, a high polygonal structure like a cathedral tower, a mass of tracery and sculpture (fourteenth century). In the public market-place at Brunswick is a fountain of the fifteenth century, of which the central structure is made of bronze. Except in Italy, few fountains are of earlier date than the fourteenth century. The Italian fountains of the Gothic period are, however, numerous and beautiful; some even belong to the late Romanesque age. The most monumental of these are, perhaps, three at Siena: the Fonte Branda, celebrated by Dante, built in the twelfth century; the Fonte Nuova, 1259; and the Fonte Gaja, 1343. This Sienese type was a large rectangular basin, 35 to 50 feet long, with a solid wall on three sides, and an arcade on the front. At the Fonte Branda the covering brick structure is 30 feet high, with three groined vaults; battlements, corbels, and blind arches were its main decorations, but terracotta ornamentation is used already in the Fonte Nuova and pilasters, with bas-reliefs and statues in niches by Jacopo della Quercia, and other famous sculptors decorated the Fonte Gaja, one of the most beautiful in Italy. Of equal beauty is the Fontana Maggiore at Perugia, one of the finest works of Niccolò and Giovanni Pisano (c. 1300). It is a twenty-four-sided polygon; four concentric steps lead up to a lower basin 30 feet in diameter, each face decorated with fine reliefs and separated by grouped colonnettes; from the water of this basin rise twenty-four columns supporting the upper polygonal basin, where angles are marked by statuettes. In the centre of this basin is a heavy bronze column supporting a bronze basin where a group of three water-nymphs now stands. To this general type belong the unrivaled group of mediæval fountains at Viterbo, where the central shaft usually rises from the lower basin, with lion-masks spouting the water supporting a second, much smaller basin on its capital, with a smaller and shorter central shaft supporting a third basin crowned by a pinnacle. In the Gatteschi fountain the two upper basins are quadrilobed, and the lower one is cruciform. They are always raised on a stepped platform, and stand in the centre of squares. Unlike the Sienese type, these fountains are entirely uncovered.

During the Renaissance the designing of fountains became an important and almost a distinct branch of art, combining in one design the resources of architecture, sculpture, and landscape decoration. Fountains were no longer confined to public squares and purposes of utility, but took their place also in the elaborate decorations of the gardens and parks of the villas or palaces of the great and wealthy. This development began in the villas erected during the middle and late Renaissance in Italy, was carried into France, where in the seventeenth century it culminated in the grandiose water effects of Saint-Cloud and Versailles, and spread into Germany and the rest of Europe. England has in general neglected this branch of decorative art, and its chief centres outside of Italy have been in France and in the capitals of the various States of Germany.

In the Italian villas of the sixteenth and seventeenth centuries water became an essential element of the garden designs, always in connection with a monumental treatment of architectural or sculptural accompaniments, to which the leading artists of the time often devoted their talents. Two types chiefly prevailed—the cascade, in which a moderate volume of water was made to produce a maximum of effect by falling in thin but brilliant sheets over multiplied obstructions—steps, basins, rocks, etc.—always in a framework of architecture with abundance of sculptured accessories; and the isolated or central fountain, in which one or many jets spouted upward fell into the highest of a series of superposed *vasques* or bowls of marble or bronze, and thence into a larger one below, and so on into a broad basin on the ground-level. Of the former type, the most extensive example is the series of cataracts in the Caserta palace gardens near Naples, by Vanvitelli (1753); but notable examples of equal or higher artistic merit are those of the Villa Lante, near Viterbo (Viguda, 1540-50), of the Villa d'Este at Tivoli (Fontana, 1580-?), and of the villas Torlonia-Conti, Aldobrandini, and Mondragone, at Frascati.

The superposed-basin type is seen in numerous admirable examples, not only in the villas, but in the public squares of many towns. Among them may be mentioned the beautiful Farnese fountain in the Lante Villa, near Viterbo; the elaborate fountain in the Piazza Pretono at Palermo (1550), by Florentine artists; the late and highly rococo Fontana Medina at Naples; the Neptune fountain, by Gran Bologna, at Bologna; the Neptune fountain, by Ammanate, at Florence; the fountain in the Piazza Madonna at Loreto; others at Fano, Viterbo (Piazza della Rocca), the Boboli gardens at Florence, etc. At Rome most of the fountains of this type are of late date—e.g. that about the obelisk of the Quirinal, the great basin fountain of the Villa Albani, the Tortoise fountain in the Piazza Mattei, that in the Piazza Navona, etc. At Rome also are three examples of another type, in which a structure like a triumphal arch pours forth one or more cataracts into a large basin, with or without scultpure; the Acqua Felice in the Piazza dei Termini (sixteenth century); the Fontana Padina (1612); and the Fontana Trevi, the most spectacular of its type and grandly composed, even if in doubtful taste (F. Fuga, 1740). This type, treated as a wall fountain, is the prototype of several fine fountains in Paris, of which the modern Fontaine Saint Michel, by Dariond, is the most ornate.

Among the earliest Renaissance fountains in France is that of Clermont-Ferrand, an elaborate and beautiful architectural design forming a species of lofty canopy in the centre of a large basin (early sixteenth century). Jean Goujon carved the sculptures for the Fontaine des Innocents, designed by Lescot, in Paris (1550; re-erected in recent times on an altered plan), whose nymphs are famous. He also made the Diana for the fountain at the Château d'Anet. The magnificent basins, jets, and other water-works at Versailles belong to a later date. The French have developed the cascade type into a greater variety of forms than is found in Italy, and have handled these with great taste, not only in such 'châteaux-d'eau' as that of Saint Cloud, but in many recent examples in which sculpture plays an important part (Fontaine Sainte Marie, at Rouen; Fontaine Longchamps, at Marseilles). The central shafted type has also been developed by modern French artists in a number of beautiful examples, such as the twin fountains by Hitorff in the Place de la Concorde, at Paris; the Louvois Fountain, by Visconti (1835); and the Fontaine des Saisons, by Carpeaux, in the Observatory gardens, in the same city. The Birague, Grenelle (by Bouchardon), Molière, and Cuvier fountains, in Paris, should also be mentioned. The fountains at Bern, Switzerland, and the Alameda Fountain at Malaga, Spain, are good examples of the simpler type, with statues on central shafts. There are a number of interesting fountains in Belgium; while at Vienna the Neuer Marktbrunnen (1739), the Hochstrahlbrunnen in the Schwarzenberg Palace gardens, and the Albert Fountain, deserve at least passing mention. The highest artificial jet fountain is that of the Palace of Herrenhausen, Hanover, which is over 200 feet high. But no other European country can compare with France and Italy in the number and beauty of its fountains, considered as works of art.

In the Orient the Greek tradition of covered fountains was continued by the Mohammedan artists, though the Moors in Spain often adopted open basins, as in the Fountain of the Lions in the Alhambra. Each city in the East was provided with many fountains, inclosed and usually covered in like the tombs, with one or more domes. Cairo, Constantinople, Adrianople, and Damascus are especially rich in them, there being three hundred in Cairo alone. They are circular, polygonal, or rectangular, and ornamented with brilliant tiles, niches, columns, carving, inlay, and gilding, and have no display of water even within, for it falls into very small basins from a concealed central supply. The finest of the Turkish fountains is the large and highly ornate Fountain of Achmet III., near the Mosque of Saint Sophia; another almost equally important is in Scutari, a suburb of Constantinople.

Artificial fountains are not abundant in American cities; yet there are some in the parks and squares of New York and other places that are occasionally in action. A recent innovation is the rising and subsiding water-jet used in New York. Decorative fountains have played an important part in the design of recent exhibitions in the United States, notably the Fountain of the Republic, by Macmonnies, at Chicago in 1893, and the fountains of Man, Nature, Progress, etc., in the Pan-American Exposition grounds at Buffalo in 1901. Within recent years drinking-fountains for men and animals have been put up more liberally in the United States, especially by private individuals, and are often artificially designed and decorated.

FOUNTAIN OF AR'ETHU'SA. See ALPHEUS.

FOUNTAIN OF CASTA'LIA. See CASTALIA.

FOUNTAIN OF VAUCLUSE, vô'klụz'. See VAUCLUSE.

FOUNTAIN OF YOUTH. A miraculous fountain having the property of restoring youth and healing sickness. Such fountains are a part of the mythology of many lands. In the Middle Ages a fountain of youth was supposed to exist in an island or region called Bimini, and was sought by Ponce de Leon, De Soto, and other Spanish explorers.

FOUNTAINS ABBEY. An extensive Cistercian monastery near Ripon, England, dating from the thirteenth century. Originally the buildings covered an area of 10 acres, but the picturesque ruins represent only a portion of the abbey. The Norman-English church is in good preservation, and the remains of the refectory, chapter-house, and great cloister are still extant.

FOUQUÉ, fōō'kā', FERDINAND ANDRÉ (1828—). A French geologist, born at Mortain, and educated at the Normal School at Paris, where he became curator of the scientific museum. After holding positions in several educational institutions and taking part in a large number of scientific expeditions, he became known particularly for his investigations of volcanoes, and in 1877 was elected to the chair of geology in the Collège de France. He was elected to the Academy of Sciences in 1881. He published a large number of scientific works, among the most important of which are: *Introduction à l'etude des roches éruptives françaises* (1879); *Santorin, et ses éruptions* (1879); *Synthèse des minéraux et des roches* (1882).

FOUQUÉ, FRIEDRICH HEINRICH KARL, Baron DE LA MOTTE (1777-1843). A German romantic novelist and poet, best known as the author of *Undine,* a classic of romanticism. He was born in Brandenburg, served in the Prussian Army from 1794 to 1813, and spent the rest of his life chiefly in Paris, on his estate in Nennhausen, and at Halle, where from 1831 to 1842 he lectured on modern history and poetry. He died in Berlin. At first he imitated Spanish poets, and then Norse legend and Old German poetry attracted him. In 1808 he published *Sigurd der Schlangentöter,* founded on the *Nibelungenlied,* and in 1881 a chivalric romance, *Der Zauberring.* Several dramas and tales of minor worth followed. But in 1814 Fouqué reached, in his *Jahreszeiten,* the summit of his genius, for of its four parts the first was *Undine* and the last *Sintram.* The second part contained *Die beiden Hauptleute,* and the third

Aslaugas Ritter and *Algin und Jucunda.* In this year he also published a romance, *Die Fahrten Thiodolfs des Isländers,* which he regarded as his best work. His numerous later writings added nothing to his reputation. His selected works (12 vols., 1841) contain little of import save what has been translated into English—*The Enchanted Ring; Sintram; Aslauga's Knight;* and the exquisite *Undine.*

FOUQUET, fo͞o′kâ′, or **FOUCQUET,** Jean (c.1415-c.90). A French miniature painter and illuminator, born in Tours. His first known works were an illuminated Bible and a portrait of Charles VII. These brought him Court favor, and about 1445 he went to Rome, where he painted the portrait of Pope Eugenius IV. After his return to France he executed a series of miniatures for a French paraphrase of Boccaccio (1458; in the Munich Library), and a *Book of Hours,* forty pages of which were bought by the Duc d'Aumale for the Chantilly Collection, for 300,000 francs. Fouquet became Court painter and illuminator to Louis XI., and in this capacity painted a number of portraits. Little of his life or work was known until some modern historians recognized his value, historically and artistically, as one of the founders of the French School. The illustrations for Josephus's *History of the Jews* (in the National Library, Paris) are perhaps his best work. His drawing is vigorous, the expression of his faces lively, and his color clear and glowing.

FOUQUET, Nicolas, Vicomte de Melun and de Vaux, Marquis de Belle-Ile (1650-80). Superintendent of Finance under Louis XIV. He was born in Paris, January 27, 1615, the son of a French nobleman high in the confidence of Richelieu. Young Fouquet was educated for the civil service, and from 1642 to 1647 was attached as intendant to the Army of the North. He was then made Commissioner of Police, Justice, and Finance in Dauphiné, and held other important offices, until, in 1648, he was called to Paris as intendant for the municipality, and became involved in the political intrigues of the day. In 1650, through the influence of Mazarin, Fouquet was given the important post of Procureur-Général to the Parlement of Paris. His attitude during the Fronde had won him the regard of the Court, and of Anne of Austria in particular, and in 1653 he was made Superintendent of Finance with a colleague, Servien. His colleague died in 1659, leaving Fouquet alone in office. As chief Financial Minister, Fouquet set himself to work to reorganize the finances of France. Corruption and maladministration, together with heavy war expenses, had drained the treasury, and it is stated that the new Minister had at first to meet expenses by negotiating loans on his own credit. Mazarin soon became jealous of his protégé's influence, and after the Peace of the Pyrenees (1659) and the marriage of the King, an open breach took place in their relations, and henceforth each sought to overthrow the other. In his anxiety to be supreme, Fouquet overdid his part; and on the death of Mazarin, Colbert (q.v.) was consulted regarding the state of the finances, and secretly influenced the King against Fouquet. Meanwhile Fouquet had secured possession of the port of Belle-Ile, and had fortified it as a place of refuge. He also erected a magnificent château on his estate at Vaux, and there, in August, 1661, he entertained the King with a magnificence and splendor hardly surpassed at Versailles. Louis XIV. would not be conciliated, however, and Fouquet would have been arrested in the midst of the festivities, but for the prayers and intercession of the Queen-mother, Anne of Austria, who was still his friend. There can be little doubt that the charges of maladministration and dishonesty brought by Colbert against Fouquet were substantially true, for the latter was forced to resort to peculation in order to keep up the almost royal state in which he lived. In an age, however, where every one connected with the royal treasury stole, it was Fouquet's only misfortune to be caught. He had been craftily persuaded to sell his office of Procureur-Général and so deprive himself of a trial before the Parlement of Paris. He was arrested at Nantes, in September, 1661, charged with malfeasance in office, to the detriment of the King, and with planning rebellion. His papers were seized and examined. After being moved from prison to prison, he was consigned to the Bastille, and in 1664 was adjudged guilty, after a very unfair trial, and was condemned to perpetual banishment, with confiscation of goods and property. This sentence the King changed to imprisonment for life, and Fouquet was sent to the fortress of Pignerol at the beginning of 1665. During his fifteen years' captivity he composed several works of a devotional nature. He died at Pignerol, March 23, 1680. During the height of his power Fouquet was a generous patron of art and literature, and was intimate with all the literary men of the day. He presented to the Bibliothèque Royale (now Nationale) 13,000 rare volumes which he had collected. He had, however, neither the breadth nor the statesmanship of his contemporary, Colbert. Consult: Cheruel, *Mémoires sur la vie publique et privée de Fouquet* (Paris, 1862); Lair, *Nicolas Fouquet* (Paris, 1890); Hássall, *Louis XIV. and the Zenith of the French Monarchy,* in the "Heroes of the Nations Series" (London, 1885).

FOUQUIER, fo͞o′kyâ′, Jaques François Henry (1838—). A French publicist, born in Marseilles. He studied law and medicine, traveled extensively, pursued a course in art at the Institute in Geneva, in 1861 entered journalism in Paris, and in 1867 was a war correspondent with Garibaldi in Italy. He held various administrative positions in the Department of the Interior, and after several unsuccessful attempts was elected, in 1889, a member of the National Assembly. He was connected editorially with *La Vraie République, Le Petit Parisien,* and *Gil Blas,* and in 1891 became the dramatic critic of *Figaro.* His publications include: *Etudes artistiques* (1859); *L'art officiel et la liberté* (1861); *Au siècle dernier* (1884); *La sagesse parisienne* (1885); and a successful play, with M. F. Carré, *Le roman d'une conspiration* (1890).

FOUQUIER-TINVILLE, tăɴ′vêl′, Antoine Quentin (1747-95). The public accuser of the Revolutionary Tribunal during the Reign of Terror. He was born at Hérouel, in the Department of Aisne, practiced law there for some time, then came to Paris and turned police spy. On the outbreak of the Revolution he figured as one of the fiercest of democrats. By Robespierre he was appointed, first a member, then director and public accuser, of the Revolutionary Tribunal. He performed the duties of his office with a bloodthirsty relentlessness that came partly from lack of feeling, partly from a brutalized conception of duty. Regarding himself as the servant of the Revolution—though he was in reality only the tool of the Committee of Public Safety—he denounced impartially men of all parties, and brought to the guillotine with equal fervor Bailly and Vergniaud, Danton and Hébert, Robespierre and Saint Just. After the passing of the Reign of Terror he was arrested, and in May, 1795, guillotined, dying bravely enough, and justifying his career in calling himself a blind instrument of the law. Consult Domenget, *Fouquier-Tinville et le tribunal révolutionnaire* (Paris, 1878).

FOURBERIES DE SCAPIN, fo͞or'be-rē' de skȧ'păN', Les. A comedy by Molière (1671), based partly on the *Phormio* of Terence. There is an English translation by Otway (1677), under the title *The Cheats of Scapin.*

FOUR CANTONS, Lake of the. See Lucerne, Lake of.

FOURCHAMBAULT, fo͞or'shäN'bō'. A manufacturing town in the Department of Nièvre, France, 5 miles by rail from Nevers, near the right bank of the Loire (Map: France, K 4). It contains one of the most important iron-foundries in France, producing bridge materials, rails, car and locomotive wheels. Population, in 1901, 6152.

FOURCROY, fo͞or'krwä', Antoine François, Count de (1755-1809). A French chemist. He was born in Paris, the son of a druggist. He became a student of medicine, supporting himself by teaching and translating until 1780, when he received the degree of doctor of medicine. About this time he delivered a course of popular lectures on chemistry and natural history which gained for him a high reputation. Buffon, in 1784, secured his appointment as professor of chemistry at the Jardin du Roi, now Jardin des Plantes, which position he held for twenty-five years. Fourcroy was one of the early converts to the theories of Lavoisier, together with whom, and with Berthollet and Guyton de Morveau, he prepared the *Méthode de nomenclature chimique* (Paris, 1787). In 1792 he was appointed a Deputy to the National Convention; in 1794 he was made a member of the Committee of Public Safety, and in 1795 of the Council of Ancients. During the time of his service he endeavored to improve the system of public education, organized the Ecole Polytechnique, and instituted schools of medicine. Under Bonaparte he became Director-General of Public Instruction, in 1801. He was the author of *La philosophie chimique* (1792); *Système des connaissances chimiques* (11 vols., 1801); and of other works on chemistry, as well as numerous papers on chemical topics.

FOUR-EYED FISH. See Anableps.

FOURIER, fo͞o'ryā', François Marie Charles (1772-1837). A French socialist. He was born at Besançon, April 7, 1772, the son of a merchant, and educated in the college there. At the age of eighteen he entered a cloth business, although from his childhood he had shown an antipathy toward commerce on account of the deception and injustice he saw in it. He visited all the large cities, not only in France, but in Holland and Germany, as a mercantile agent, thus gaining an opportunity for careful observation of social conditions. At his father's death he inherited 80,000 francs, and invested it at Lyons in colonial products. During the siege of Lyons, in 1793, all his property was destroyed; his bales of cotton were used as breastworks, his provisions were taken to feed the soldiers; and he was himself thrown into prison. Later he entered the army, but he was forced to resign on account of ill health. The rest of his life was spent in mercantile pursuits. In 1799, as agent for a great provision merchant, he had to destroy a large quantity of rice which had been held for higher prices so long that it had become unfit for consumption. The destruction of food needed by the poor made a lasting impression on his mind, and is said to have first turned his attention to social problems. His business enterprises did not prosper, and for the greater part of his life he was in straitened circumstances. His chief works were the *Théorie des quatre mouvements et des destinées générales,* published in 1808; the *Traité d'association domestique agricole* (1822), which contains his whole system, and was later republished under the title, *Théorie de l'unité universelle;* and *Le nouveau monde industriel ou invention du procédé d'industrie attrayante et combinée, distribuée en séries passionées* (1829). Before his death he had a few followers, the most important one of whom was M. Just Muiron, who was converted to Fourierism in 1814. Fourier died October 10, 1837. After his death his party gained many adherents, among whom were some of the Saint-Simonians. A newspaper was published, and the 'Society for the Propagation and Realization of the Theory of Fourier' was established. See Fourierism.

FOURIER, Jean Baptiste Joseph, Baron (1768-1830). A French geometer and physicist, born at Auxerre. He was the son of a poor tailor, and was left an orphan at the age of eight. The Bishop of Auxerre, recognizing his ability, placed him in a Church military school, where he soon showed a decided aptitude for mathematics. At the age of nineteen he wrote his memoir, *Sur la résolution des équations numériques de degré quelconque,* which was presented to the Academy in 1789. He took part in the Revolution, but in 1795 was sent as a student to the newly founded Ecole Normale, and soon after obtained the chair of analysis in the Ecole Polytechnique (1795-98). He went to Egypt in 1798 and was made perpetual secretary of the Institute of Cairo, and in the following year was placed at the head of one of the two scientific expeditions to the upper Nile. He returned to France in 1801 and was made (1802) Prefect of Isère, a position which he filled with his usual tact and energy. Napoleon created him a baron in 1808; but as, in 1814, he gave brief allegiance to the Bourbons, his political career was wrecked by the return of the Emperor from Elba. He was, after much difficulty, made a member of the Academy of Sciences in 1815, and succeeded Delambre (1822) as perpetual secretary for the mathematical sciences. He later became a member of the French Academy (1826). Fourier was one of the leading mathematical physicists of his time. His labors were divided between the study of the theory of heat and of numerical equations. Among his leading works are the following: *Théorie analytique de la chaleur* (1822); *Analyse des équations déterminées* (posthumous, 1831); a memoir on statics (*Journal de l'Ecole Polytechnique*, 1797-98); and numerous memoirs on equations. His works, including references to numerous biographical sketches, were published by Darboux under the title, *Œuvres de Fourier* (Paris, 1889-90).

Fourier's Series, communicated by Fourier to the Academy toward the end of 1807, plays an important part in mathematical physics. Consult Du Bois-Reymond, *Zur Geschichte der trigonometrischen Reihen* (Tübingen, 1880).

FOURIERISM. This term is applied to the doctrines of Charles Fourier, and to the communistic movement inspired by Fourier's teaching. Fourier claimed to have discovered a mathematical basis for social organization. The chief difference between the social system which he advocated and those of his contemporaries, Saint-Simon and Owen, is found in the retention, for a time, at least, of private property and inheritance in Fourier's scheme. Fourier believed that man is capable of becoming perfect. His fundamental propositions were that the universe is governed by laws, and that man, by means of reason, can discover these laws and can apply them to the organization of society. When this shall be done, social harmony will reign, and unhappiness will be unknown. As yet, society is in its infancy. The different systems which the human race have established in the past have been only experiments, but each one has been superior to the one which it replaced. This development will continue until perfection is reached. The ideal, according to Fourier, has not been realized because our civilization is false—because the false sciences of ethics, economics, philosophy, and politics are followed instead of the true sciences—chemistry, physics, mathematics. The social organization outlined by Fourier is based on the *passions* or desires of man. There are twelve passions: five sensitive—seeing, hearing, smelling, feeling, and tasting; four affective—amity, love, paternity, and ambition; and three distributive—cabalistic, alternating, and composite. If all these passions are given free play, *passional attraction* causes the spontaneous formation of groups in society. The unit of society must be large enough to allow all the passions to operate freely in all possible combinations, and should therefore consist of about two thousand persons. Each group, or *phalanx*, should occupy a single building and provide itself with all the commodities and amusements desired. The chief occupations are agriculture, manufactures, commerce, domestic economy, art, science, education, and government. Within the phalanx the members are arranged in series and groups according to the law of passional attraction. Special corporations are organized for each branch of industry. Individuals enroll themselves for those occupations for which they have natural aptitudes, and are allowed to change from one to another as often as they please. Thus work yields only pleasure. Fourier expected that association would economize expenditure and effort to such an extent that a man would need to work only ten years of his life. Under his system salaries are abolished; each person receives an ample minimum, and the surplus is distributed according to the amount of labor, capital, and skill contributed—five parts to labor, four to capital, and three to talent. There are no drones, since all the people are anxious to confer benefits upon society. Surplus products are exchanged between phalanxes. Industrial armies are sent out to prepare new lands for occupation. Government, so far as there is any, is republican, with annual election of officers. Since there is no discord, there are no soldiers, policemen, or criminals. At first Fourier expected society to become practically anarchistic, but later he found it necessary to map out a definite hierarchical scheme of government. The unit, of course, is the phalanx, which is ruled by a *unarch.* Three or four phalanxes form a union; three or four unions a district; a number of districts, a province. Nations, empires, caliphates, regions, continents, and finally a world unity are formed by similar combinations. The rulers, in hierarchical succession above the unarch, are called duarchs, triarchs, and so on, up to the omniarch, who rules the whole world. In addition to unity of government, there is unity of language, of weights and measures, of surveying. In fact, unity is one of Fourier's fundamental concepts. He maintained that the law of gravitation governs not only matter, but the other three movements—social, animal, and organic—as well. He found three indestructible principles—God, or spirit, the active and moving principle; matter, the passive principle; and justice or mathematics, the regulating principle to which reason corresponds. He expected great transformations to result from a social organization which would allow these natural forces to coöperate freely. Wild animals would willingly become man's servants, the North Pole would become habitable, sea-water would be as palatable as lemonade, and man would develop new organs, such as an eye in the back of his head. Fourier claimed that the human race will remain on this earth until a cycle of 80,000 years has been completed. The period of manhood is at hand. The race will continue to develop for 35,000 years, and then decline for 40,000 years.

After the death of Fourier, his party made a large number of converts in France, and many communities were formed to test his system. In every case where Fourier's suggestions were followed in detail the attempt failed. However, M. Jean Godin has founded at Guise a community where labor and capital are associated much after the plan of Fourier, but with many objectionable features left out. The establishment consists of iron, copper, sugar, and chicory factories, and has been very prosperous. In the United States the system has had little success. Fourierism was introduced in 1842 by Albert Brisbane and spread like an epidemic. No less than thirty-four associations were formed in all parts of the North and West, but few held out more than four or five years. The most notable of all was Brook Farm (q.v.).

Consult: Charles Pallarin, *Charles Fourier, sa vie et sa théorie* (Paris, 1843); Parisot, *Fourier, sa vie, ses œuvres;* E. Sambuc, "Considérations sur Charles Fourier," in *Archiv für Geschichte der Philosophie* (Berlin, 1900); Richard T. Ely, *French and German Socialism in Modern Times* (New York, 1883). For a literary exposition of the ideals and plans of modern Fourierists, see Emile Zola's novel *Travail.*

FOUR LAKES. A chain of connected sheets of water in Wisconsin, emptying into the Catfish, a northeastern tributary of the Mississippi River (Map: Wisconsin, D 5). They are navigable for steamboats, and drain a beautiful country. The waters are clear and cold. Madison, the capital of the State, lies between Mendota and Monona, the two largest lakes. Their combined area is 230 square miles.

FOUR-LINED SNAKE. See Chicken-Snake.

FOURMIES, fo͞or'mē'. A manufacturing town and railway junction, in the Department of Nord, France, 36 miles southeast of Valenciennes (Map: France, L 1). It contains numerous cotton and woolen mills and other industrial establishments. Population, in 1901, 14,083.

FOURNEL, fo͞or'nĕl' François Victor (1829-94). A French author, born at Cheppy, near Varennes, and educated at Verdun and Paris. He went into journalism in Paris, and was attached successively to the editorial staffs of *Le Français, Moniteur Universel,* and *Gaulois.* His publications include: *Les contemporains de Molière* (3 vols., 1863-76); *Curiosités théâtrales* (1859); *Esquisses et croquis parisiens* (1876); *Vacances d'un journaliste* (1876); *Voyages hors de ma chambre* (1878); *Aux pays du soleil* (1883); *L'ancêtre* (1881); *Figures d'hier et d'aujourd'hui* (1883); *De Malherbe à Bossuet* (1884); *Petites comédies rares et curieuses du XVIIème siècle* (1884); *Les artistes français contemporains* (1885); *La confession d'un père* (1886), which was crowned by the Academy; *Maman capitaine* (1889); *Les hommes du 14 juillet* (1890).

FOURNET, fo͞or'nȧ', Joseph Jean Baptiste Xavier (1801-69). A French geologist and meteorologist, born at Strassburg and educated at the School of Mines in Paris. He took part in several geological exploration expeditions, and in 1834 became professor of geology in the faculty at Lyons, which position he retained until his death. He was an authority upon the geology of the Alps and of southeastern France, and his original investigations were of considerable note, especially his discovery in connection with the sulphurization of metals, which was named from him 'Fournet's law.' He was a prolific contributor to various scientific publications and annals. Among his other publications were: *Géologie lyonnaise* (1862), and *Du mineur, son rôle et son influence sur les progrès de la civilization* (1862).

FOURNIER, fo͞or'nyȧ', August (1850—). An Austrian historian, born and educated in Vienna, where he served in the Ministry of the Interior, and in 1875 established himself as lecturer on Austrian history at the University. Appointed professor there in 1897, he was called in the same capacity to the University of Prague in 1883 and to the Polytechnic School in Vienna in 1899. As a member of the Reichsrat (1891-1900), and of the Bohemian Diet (1892-1901), he belonged to the German Liberal Party. Of his writings, *Napoleon I. Eine Biographie* (1886-89), which was immediately translated into French, is the most noteworthy. Besides many contributions to various periodicals, his other works include: *Gentz und Cobenzl Geschichte der oesterreichischen Diplomatie, 1801-05* (1880); *Historische Studien und Skizzen* (1885); *Handel und Verkehr in Ungarn und Polen um die Mitte des 18. Jahrhunderts* (1887); and *Der Kongress von Châtillon* (1900).

FOURNIER, Claude (1745-1825). A French revolutionist, born at Auzon. He went to Haiti, and engaged in the manufacture of rum there, but his factory was burnt; he returned to France and was called for his stay in the New World *L'Américain.* He was active in all the great revolutionary days in the years 1789-92; was accused of plotting the murder of the Orleans prisoners who were killed while under his charge (1792), but was not found guilty; and, in spite of Marat's joining his accusers, was equally fortunate when accused of inciting insurrection. He was in the infernal machine plot of the Rue Saint Nicaise, was found guilty, and deported, and did not return until 1809. In 1811 he was again a conspirator and was sent to the Château d'If; was set free by the first Restoration, and was accused of a plot against the Bourbons after their second return, but set free again in 1816. He spent his last years in parading his royalist sentiments in hopes of a pension, but died a poor man.

FOURNIER, Jean Alfred (1832—). A French physician, specialist in skin diseases. He was born in Paris, and was a pupil of Ricord. He was *interne* in 1854, and in 1863 became physician at the Lourcine Hospital, where he began his studies and lectures on syphilis, on which he has written extensively. He became clinical professor in this branch at the University of Paris in 1880, and after four years at the Hospital Saint Louis.

FOURNIER, Paul Eugène Louis (1853—). A French jurist, born at Calais. He was educated at the Ecole des Chartes, and became professor of Roman law at Grenoble. He is considered an authority on canonical law, in which subject he has written the following important works: *Le Liber Tarraconensis;* "Etudes sur une collection canonique du XIe siècle" (in *Mélanges Julien Havet,* 1895); "Les collections canoniques attribuées à Yves de Chartres" (in *Bibliothèque de l'Ecole des Chartes,* 1896); *Joachim de Flore: Ses doctrines, son influence* (1900).

FOURNIER, Pierre Simon (1712-68). A French type-founder and author. He was born in Paris, and probably received his first instruction from his father, who was director of the foundry of Guillaume Le Bé. In 1736 he established his own foundry, the entire material for which he manufactured himself. Especially celebrated were his ornamented letters. He also contributed greatly to the improvement of musical type, which subject he discussed in a special work. He further had the distinction of publishing the first *Manuel typographique* (1764-66), a work which became exceedingly popular, and remained so long after the death of its author. Among his principal publications may be mentioned: *De l'origine et des productions de l'imprimerie primitive en taille de bois* (1759); and *Traité historique et critique sur l'origine et les progrès des caractères de fonte pour l'impression de la musique* (1765).

FOURNIER, Télesphore (1824-96). A Canadian jurist, born in Saint François, Quebec. He was educated at Nicolet College, and was called to the bar of Lower Canada in 1846. In 1863 he was appointed Queen's Counsel. He was elected to the Canadian Parliament in 1870, and became a privy councilor in 1873. In the same year he took his seat as Minister of Internal Revenue in the Mackenzie Cabinet, was transferred to the portfolio of Justice in the summer of 1874, and from May to October, 1875, was Postmaster-General. In the latter month he was appointed a puisne judge in the Supreme Court of the Dominion of Canada, a court which he himself, while Minister of Justice, had organized, and he continued upon the bench until his death.

FOUR-PART WRITING. In music, writing for four different voices. It is the foundation of all composition. The student begins his studies by writing exercises and chorals for four voices, because thus he is enabled to employ all the intervals of a chord of a seventh; and in the case of triads he need only double the fundamental tone. Three-part and two-part writing require more skill, because some interval of a chord must be omitted. Four-part writing employs generally mixed voices, i.e. soprano, alto, tenor, and bass. But four-part compositions for female (two soprano, two altos) and male voices (two tenors, two basses) is also very common. Writing for mixed voices is easier because of the greater range within which the several intervals of a chord may be arranged. Here the composer has three octaves, from A to a^2, at his disposal, while in writing for male or female voices his range is practically limited to two octaves, from A to a^1 or a to a^2 respectively. See HARMONY.

FOUR P's, THE. The best-known of the interludes by John Heywood (about 1543). The Four P's are a Palmer, a Pardoner, a Potecary, and a Pedlar.

FOUR PRENTICES OF LONDON, THE. A chronicle play by Thomas Heywood, written about 1600, and printed in 1615 and 1632. It was attacked by Beaumont and Fletcher in *The Knight of the Burning Pestle.*

FOUR SONS OF AYMON, THE. See AYMON.

FOURTH. See INTERVAL.

FOURTH DIMENSION. See GEOMETRY.

FOURTH PARTY, THE. A name applied, about 1880 to an opposition group within the English Conservative Party, under the leadership of Lord Randolph Churchill (q.v.).

FOURTH STATE OF MATTER. See MATTER, THEORIES OF.

FOURTOU, fo͞or′to͞o′, OSCAR BARDY DE (1836-97). A French legislator. He was born at Ribérac (Dordogne), and was educated at Poitiers. After acting as mayor of his native town, he was elected a member of the National Assembly in 1871. Thereafter he successively became Minister of Public Works (1872), Minister of Public Instruction (1873-74), and Minister of the Interior (1874 and 1877). He was identified with the Clerical Bonapartist Party, and as Minister of the Interior conducted a vigorous and aggressive campaign against the Republicans. He dismissed all prominent representatives of that party then holding office, and appointed Bonapartists to the positions thus vacated. Particularly aggressive was his attitude toward the Republican press, which for a time was subjected to a relentless persecution.

FOVILLE, fō̇′vēl′, ALFRED DE (1842—). A French political economist and statistician, born in Paris and educated at the Polytechnical School in that city. He served successively as auditor of the Council of State, chief of the Bureau of Statistics, and professor at the School of Political Science. In 1877 he became editor of the *Bulletin de statistique et de législation comparée.* His publications include: *Mémoire sur les variations des prix au XIXème siècle* (1872); *Atlas de statistique financière* (1881 and 1889); *La richesse en France et à l'étranger* (1893); *L'industrie des transports dans le passé et dans le présent* (1893).

FOWEY, foi. A seaport town of Cornwall, England, on the south coast, 22 miles west of Plymouth (Map: England, B 6). It is noted for its picturesque situation amid hill and cliff scenery, and is a favorite artist resort. It has a deep harbor, with a narrow entrance guarded by three forts, and in the thirteenth and fourteenth centuries was one of the chief seaports of England. Its principal industry is the pilchard fishery, and it has a considerable export trade in the chinastone and iron ore of neighboring quarries and mines. Population of parish, in 1891, 7020; in 1901, 7691.

FOWKE, GERARD (born SMITH) (1855—). An American archæologist and ethnologist, born in Maysville, Ky. For many years he was connected with the United States Bureau of Ethnology in investigations in the Eastern United States, and in the Ohio Valley. The results of his discoveries were published in the *Annual Reports* of the Bureau. In 1894 and 1896 he investigated the supposed Norse remains near Boston. Afterwards he was engaged in explorations on Vancouver's Island, and in 1898 explored the lower Amur River, Siberia, for the American Museum of Natural History, New York City.

FOWL (AS. *fugol*, OHG. *fogal*, Ger. *Vogel*, Goth. *fugls*, bird, fowl). A word commonly used now in a restricted application to useful birds, chiefly of the gallinaceous order. Thus, 'wild fowl' and 'water-fowl' mean those birds of land and water respectively in which sportsmen are interested, and 'barnyard fowl' are the domesticated kinds—poultry. When used in the singular, however, the word almost invariably signifies a full-grown domestic chicken.

DOMESTIC CHICKENS. Chickens are raised in the United States for their flesh, for the production of eggs, and as fancy stock for exhibition purposes. According to Howard there are 87 standard and a large number of promiscuous varieties of chickens raised in the United States, which have been divided into 10 classes. For practical purposes the 10 classes may be grouped into four general classes as follows: (1) General-purpose breeds, the American class; (2) meat or table breeds, the Asiatic class; (3) egg-making breeds, the Mediterranean class; (4) ornamental breeds, the Polish, exhibition games, miscellaneous, and bantam classes.

The *Plymouth Rock* is the most popular of all breeds of chickens for general purposes. It is of medium size, hardy growth, and good egg-laying qualities. The barred variety is the most generally known. It is of a grayish-white color, regularly crossed with parallel bars of blue-black running in straight distinct lines throughout the entire length of the feathers. The standard weight of the cocks is nine and one-half pounds; and of hens, seven and one-half pounds. Other varieties of Plymouth Rock are very like the barred except in color. The *Wyandottes* are rated next to the Plymouth Rocks as general-purpose fowls. The *Light Brahma*, which became popular between 1850 and 1860, is the leading variety of the Asiatic class. The male is pure white in color excepting the hackle, tail, and flights, which are black, and white striped with black. The shanks are well feathered, with the feathering extending down to the middle toe. The Brahma female has a white head; hackle white, striped with black; cape white and black, completely covered by the hackle when the bird stands erect. The average Light Brahma male is 26 inches in height. The standard weight of the cock is 12 pounds; of the hen, nine and one-half pounds. The *Cochins* are second only to the Brahmas for edible purposes, weighing somewhat less than the Light Brahmas. There are several varieties of Cochins: Buff, partridge, black, and white. All have heavy leg and foot feathers. The *Leghorns* are the best known of the egg-producing varieties of the Mediterranean class. They mature early and feather quickly. The pullets often begin laying when four months old. There are a number of varieties of Leghorns which differ in color and in the form of comb, which in all cases is large and a distinguishing mark of the breed. The Leghorn cock has a graceful, round and plump body, broad at the shoulders and tapering toward the tail. The Leghorn hen in many respects resembles the cock in shape and carriage, and is even more graceful. The *ornamental breeds* vary greatly. Bantams are characterized by their small size; the silky fowls by their soft webless feathers, which when in prime condition are less fluffy and stand out from the body in all directions; and the Yokohama fowls by the great length of the tail and hackle feathers, the tail-feathers of the cock sometimes attaining a length of six feet or more. The *Games* are commonly divided into two distinct varieties—exhibition and pit. The exhibition game is long, lanky, close-feathered throughout and spare in tail-feathering. The pit is short, stout and stocky, with abundant tail-feathering, and for the farm and general purposes has always been considered a practical and profitable fowl. It is hardy, matures early, is a good layer, and its flesh is considered of exceptional value for the table, being fine-grained, tender, and sweet. The hens are splendid sitters and careful mothers.

Industrial Considerations. Chicken-raising, an important industry whether conducted as a special business or as a part of general farming, depends upon suitable houses and proper care and feeding. It is very desirable that chickens be provided with a house somewhat separated from the other farm buildings, but near enough to the barnyard so that they can spend a part of their time in scratching for and gathering up the many seeds and grains that would otherwise not be utilized. Poultry-houses need not be elaborate in their fittings or expensive in their construction. Material and construction will vary in different regions, but the houses should always be planned with regard to cleanliness and convenience. They should be cool in summer and warm in winter, and, when it is not desirable to allow poultry free range, the houses should be provided with yards or runs, because chickens need exercise. Coops for young chickens are of various styles, some being very simple, and others provided with yards covered with netting to exclude hawks and cats. The poultry-house should be located upon soil which is well drained and dry. A gravelly knoll is best, but, failing this, the site should be raised by the use of the plow or scraper until there is a gentle slope in all directions, sufficient to prevent any standing water even at the wettest times. A few inches of sand or gravel on the surface will be very useful in preventing the formation of mud. A group of evergreens or other windbreak will be a decided advantage in sheltering the house from the north and northwest winds in the colder parts of the country.

The amount of space to be allowed per chicken depends upon the size of the fowls, whether a shed is attached to the house, and whether the fowls have free run of the open fields. For chickens in confinement there should be from six to fifteen square feet for each adult bird in case there is no shed attached to the house; with a shed this space may be reduced about one-half. The yards should be large enough to allow exercise in the open air, and to furnish more grass than the birds will eat. This will vary from 60 to 150 square feet per adult bird. An open shed facing the south is of great assistance in maintaining the health and productiveness of the flock. In it the birds can be induced to hunt for their food and take exercise in all seasons of the year, and where they can enjoy scratching and dusting themselves in the sunshine, even during the winter months. Chicken-houses provided with earth floors are frequently damp and unsatisfactory, and the cause of various poultry diseases. Cement floors are cold, and also more or less damp. According to D. A. Salmon, who is authority for many of the statements given here, a good cement floor laid on broken stone, and covered with a few inches of earth, would probably be satisfactory, if not too expensive. A board floor, six or eight inches above the earth, with good ventilation under it, is dry but too cold, except in the South. A double flooring, laid tightly with building paper between, or a good single flooring covered with a few inches of dry earth, is probably the best. In all cases of board floors there should be sufficient space beneath for ventilation, and to guard against lodgment of rats. Convenient roosts should be provided. They should be nearly flat or rounded slightly on the upper surface. Crevices in which vermin may hide should be avoided. Such precautions suffice in most cases to keep the poultry free from chicken-lice, the characteristics of which are given under Louse. The roosting-space allowed should be 6 to 8 inches for the small breeds, 8 to 10 inches for the medium, and 10 to 12 inches for the large breeds of chickens.

Nests and Eggs. Suitable nests are an essential requirement for egg-laying stock. The simplest form of nest is a box placed upon the floor of the poultry-house. With heavy fowls, which are apt to break their eggs in fighting away other hens that try to enter their nests when they are laying, and thus acquire a habit of egg-eating, a more concealed or dark nest may be necessary. Although on small farms, in towns, and in villages it is generally necessary to confine poultry in houses and yards, there are many large farms where poultry may be raised with the greatest economy by allowing them to range.

The large area at their disposal furnishes an exhaustive supply of insects and worms, and an abundance of water, seeds, and grains which chickens alone can utilize. Under such circumstances fowls take care of themselves so well, and are so energetic in seeking their food, that they are either forgotten, and allowed to shift for themselves when they really need attention and assistance, or they are regarded as a nuisance because they sometimes do a little damage. When fenced away from the garden and flower-beds, fowls do little damage, and cause scarcely any annoyance on a farm. On the other hand, they do an immense amount of good in the protection of crops by the destruction of injurious insects, larvæ, and worms, and are especially useful on fruit farms. Eggs are hatched under the hens or in incubators. Incubator chicks may be conveniently cared for in brooders or 'artificial mothers.' Many incubators and brooders have been devised which have been shown by experience to be satisfactory.

Feeding. Chickens require a mixed diet of grain, animal food, and green or succulent materials. The food must also supply the lime and other mineral matters needed for egg-shells, and an abundance of grit, required for digesting food, is also essential. Pure water should at all times be provided. A number of forms of drinking-fountains have been provided to meet the latter requirements. When only a small flock of hens is kept, chiefly to provide eggs for family use, a mistake is frequently made in feeding too much corn. It has been shown by experiments that corn should not form a very large portion of the grain ration of laying hens, as it is too fattening, especially for hens kept in close confinement. Corn, no doubt because of its cheapness and abundance, has generally been considered in the United States to be the most valuable poultry food. In recent years, more than formerly, wheat has been fed and the poultry ration thereby improved. Wheat is preferable to corn, and oats are an excellent food, better, perhaps, than any other single grain, particularly if the hull has been removed. When comfortable quarters are provided, fowls kept for egg production should have a ration with a nutritive ratio of about 1:4. When poultry is fed for the production of flesh, the ration should contain more fat and carbohydrates in proportion to the protein; that is, it should have a wider nutritive ratio than the ration cited for egg production. For forcing fowls for egg production, as in forcing animals for a large yield of milk, the ration should be made up of a number of kinds of grain. Experiments have shown that fowls not only eat their food with better relish if it is composed of many kinds of grain, but that the proportion digested is larger than when made up of fewer constituents. The food consumed has an effect upon the flavor of eggs, and in extreme cases upon the odor also. Thus, onions when fed for a considerable time produce a noticeable flavor in eggs. The majority of poultry-raisers believe that ground food or soft food should form a part of the daily ration, and that it is desirable to feed soft food in the morning, as it will be digested and assimilated quicker than will whole grain. A mixture of equal parts by weight of corn-meal and ground oats added to an equal quantity of wheat, bran, and fine middlings is recommended as a satisfactory food if mixed with milk or water. It should be thoroughly wet without being sloppy. The dry grain ration should consist largely of whole wheat with some oats and perhaps a little cracked corn. This should be scattered in the litter, which should always cover the floor of poultry-houses, in order that the fowls be compelled to seek the corn, and thus obtain a considerable amount of exercise. The litter also insures cleanliness. Straw, chaff, buckwheat hulls, and cut corn-stalks all make excellent litter. At night, just before the fowls go to their perches, they should have all the corn they will eat up clean. Some green food should be given to poultry, although perhaps it is not absolutely necessary. Clover, rape, cabbage, etc., are recommended for the purpose. Green food is especially desirable when chickens are kept in yards throughout the entire year.

Fowls as Food. The flesh of chickens is esteemed for its delicate flavor. The young chickens are often spoken of as broilers. For composition and food values of broilers and fowls, see tables under Food.

Chickens are ordinarily broiled or fried, roasted or baked, boiled or stewed, and are seasoned and garnished in many different ways. While delicate flavor and appetizing appearance contribute to the popular esteem in which poultry are held in all regions, there is an additional reason for their extended use in warm climates. This is the fact that poultry may be kept alive and killed as they are needed for the table; thus when means of cold storage are absent, the loss from spoiling may be much more readily avoided than is the case with larger animals used for food. It is commonly believed that the flesh of poultry is quite thoroughly and easily digested, and thus especially suited for the diet of invalids. The value of eggs as food and their place in the diet are discussed under the title Eggs.

Bibliography. A very large number of books have been published on the general subject of poultry, among which are the following: Wright, *The Book of Poultry* (London, Paris, Melbourne, 1891); Watson, "Fowls, Care and Feeding," in *United States Department of Agriculture Farmers' Bulletin 41* (Washington, 1900); Howard, "Standard Varieties of Chickens," in *United States Department of Agriculture Farmers' Bulletin 51*, illustrated (Washington, 1900); A bibliography of *Poultry Literature, United States Department of Agriculture, Library Bulletin 18* (Washington, 1899); McGraw, "The Plymouth Rock," and "The Wyandotte," in *United States Department of Agriculture, Bureau of Animal Industry Bulletins 29* and *31* respectively (Washington, 1901); Salmon, "Poultry Raising on the Farm," in *United States Department of Agriculture, Bureau of Animal Industry, Bulletin 141* (Washington, 1900).

FOWL CHOLERA. A virulent infectious disease of poultry common in Europe and America, which takes the form of a septicæmia, and is due to a specific micro-organism. It was first studied in 1782, and was referred to anthrax. Chickens are especially susceptible, but it occurs also in geese, ducks, pigeons, and even rabbits. Three forms of the disease are recognized: the apoplectic, the acute, and the chronic. In the first form the bird becomes suddenly dull, the wings droop, the eyelids fall and the feathers are elevated, the comb soon turns purple, the temperature rises to about 43° C., and death occurs within from two to five hours. In the second form the same symptoms appear with the addition of acute diarrhœa, but the bird afflicted may suffer from twelve to sixty hours or perhaps recover after the diarrhœa has persisted for about two weeks. In the chronic form a permanent or an intermittent diarrhœa is the most marked symptom, and death from extreme emaciation and exhaustion is postponed for some weeks.

The micro-organism may gain entrance to healthy birds through the mucous membranes of the eye, respiratory and alimentary tracts. The blood, all mucous and serous secretions, and excrementitious matter from affected birds are virulent; but when exposed to heat, fresh air, or direct sunlight, they become innocuous. The virus may be destroyed by a one per cent. solution of salicylic, benzoic, or carbolic acid. Healthy birds may be immunized by inoculation with attenuated virus or with serum from immunized birds. No medicinal treatment is of any avail in the apoplectic and acute forms. In chronic cases dilute acids sometimes assist the birds to recover. After an outbreak of this disease, the poultry quarters should be cleaned and disinfected. Healthy birds should not be allowed to run on the ground where diseased birds have been. Consult: Salmon, *Poultry Diseases* (Washington, 1899); Theobald, *Parasitic Diseases of Poultry* (London, 1896).

FOWL'ER. A libertine in Shirley's *Witty Fair One*, who is made to believe that he has died, and is atoning for his vices as a spirit.

FOWLER, Charles Henry (1837—). An American clergyman of the Methodist Episcopal Church, born in Burford (Ontario), Canada. He graduated at Syracuse University in 1859, at the Garrett Biblical Institute (Evanston, Ill.) in 1861; entered the ministry of the Methodist Episcopal Church in the Rock River Conference in 1861, and held various pastorates in Chicago, Ill. From 1872 to 1876 he was president of the Northwestern University (Evanston and Chicago, Ill.), in 1876 became editor of the *Christian Advocate*, the leading periodical of the Methodist denomination in America, and in 1880 missionary secretary. In 1884 he was elected a bishop. He visited South America in 1885, and organized there a very efficient missionary work. Three years later (1888), on a tour of visitation around the world, he founded the Pekin University and the Nankin University in Central China, and organized the first Methodist Episcopal Church in Saint Petersburg, Russia. He further assisted in establishing the Nebraska Wesleyan University (University Place, Neb.), and greatly improved the condition of the Methodist Episcopal Church in San Francisco, Cal. He became favorably known as a preacher and occasional speaker, but won his chief recognition as an able and energetic administrator.

FOWLER, Ellen Thorneycroft (c.1873—). An English novelist, eldest daughter of Sir Henry Fowler, Secretary of State for India (1894-95). Miss Fowler lives at Woodthorne, Wolverhampton, Staffordshire. After publishing several volumes of mediocre verse, and a volume of short stories (*Cupid's Garden*, 1897), she at once gained popularity by a clever society novel entitled *Concerning Isabel Carnaby* (1898). It has been followed by *A Double Thread* (1899); *The Farringdons* (1900); *Sirius and Other Stories* (1901); a volume of poems entitled *Love's Argument* (1900); and *Fuel of Fire* (1902).

FOWLER, Frank (1852—). An American figure and portrait painter, born July 12, 1852, in Brooklyn, N. Y. He was educated by private tutors and at the Adelphi Academy in that city. After leaving school he studied for two years in Florence, Italy, under Edwin White. From Florence he went to Paris, where he studied for seven years under Carolus Duran and Cabanel, and at the Ecole des Beaux-Arts. He rendered valuable assistance to Duran on the fresco of Marie d' Medici at the Luxembourg. He has painted a number of public men, notably Governors Tilden and Flower, also Archbishop Corrigan, Charles A. Dana, and others. He received medals at Paris and Atlanta. He has written a large number of articles on art topics for the magazines, and a book, *Portrait and Figure Painting*, besides various text-books on drawing and portrait painting. His technique is broad, with a fresh and delicate treatment, and he gives a faithful rendering of his subjects, with a poetic and imaginative conception.

FOWLER, Harold North (1859—). An American classical philologist, born at Westfield, Mass. He received the degree of A.B. from Harvard University in 1880, and Ph.D. from Bonn in 1885. He was professor of Greek in the University of Texas, 1892-93, and in the College for Women, Western Reserve University, from 1893; was associate editor of the *American Journal of Archæology*, and editor of Thucydides, book v. (Boston, 1888), and of Plautus's *Menæchmi* (Boston, 1889), etc.; and is the author of various philological papers and reviews.

FOWLER, Henry Hartley (1830—). An English statesman, born at Durham. He was a Liberal member of Parliament for the undivided Borough of Wolverhampton from 1880 to 1885, when he was returned for the East Division. At the close of the Gladstone Administration of 1880 he was Under-Secretary at the Home Office (1884-85). He became Financial Secretary to the Treasury and a privy councilor in 1886, and from 1892 to 1894 was president of the Local Government Board, in which office he carried through Parliament the Parish Councils Bill. In 1894-95 he was Secretary of State for India, and in the latter year was knighted.

FOWLER, Sir John (1817-98). A British hydraulic and railway engineer. He was born in Sheffield, England, and after engaging in various important works, he became acting engineer in the construction of the Stockton and Hartlepool railways. At the age of twenty-seven he was selected as engineer for the construction of the large group of railways known as the Manchester, Sheffield, and Lincolnshire. Having settled in London, he was continuously employed in the laying out and construction of railways and docks, and in the improvement of rivers and reclamation of lands from the sea. He designed and constructed the Metropolitan Underground Railway of London; with Sir Benjamin Baker designed and constructed the great Forth bridge (1890); was for many years consulting engineer to the Egyptian Government, and was made a baronet in 1890.

FOWLER, Lorenzo Niles (1811-96). An American phrenologist and lecturer, the brother of Orson Squire Fowler (q.v.). He lived in England in 1863-96. Besides works which he wrote jointly with his brother, he published: *Synopsis of Phrenology and Physiology* (1844); and *Marriage, its History and Philosophy, with Directions for Happy Marriages* (1846). He was also concerned in the publication of the *American Phrenological Journal*, and the *Water Cure Journal*, afterwards called *Science of Health.*

FOWLER, Orson Squire (1809-87). An American phrenologist. He was born in Cohocton, Steuben County, N. Y., and was educated at Amherst College, where he graduated in 1834. While studying mental philosophy at college he became interested in phrenology, to the study of which he devoted all his spare time. After graduating he settled in New York, where, in conjunction with his brother Lorenzo, he began writing and lecturing on phrenology. In 1836 he published his first book, *Phrenology Proved, Illustrated, and Applied*, and in 1838 he founded the *American Phrenological Journal*, which he edited until 1865. During the rest of his life he spent the greater part of every year lecturing on phrenology throughout the United States and Canada. Before the Civil War he was an ardent abolitionist, and later became much interested in temperance work. He was the founder of practical phrenology in the United States. Among his numerous published works are: *Memory and Intellectual Improvement* (1841); *Physiology, Animal and Mental* (1842); *Matrimony, or Phrenology Applied to the Selection of Companions* (1842); *Self-Culture and Perfection of Character* (1843); *Hereditary Descent, Its Laws and Facts Applied to Human Improvement* (1843); *Love and Parentage* (1844); *The Self-Instructor in Phrenology and Physiology* (1849); *Sexual Science* (1870); and a number of other works in collaboration with his brother.

FOWLER, Thomas (1832—). An English educator and philosopher, president of Corpus Christi College, Oxford. He was born in Lincolnshire, and was educated at King William's College, Isle of Man, and at Merton College, Oxford, where he graduated in 1854. In 1855 he became a fellow and tutor of Lincoln College, Oxford. He won the Denyer Theological Essay prize in 1858, was made select preacher in 1872, and was elected professor of logic in 1873. This chair he occupied until 1888, becoming meantime (1881) president of Corpus Christi College. From 1899 to 1901 he was vice-chancellor of the University of Oxford. His publications include: *The Elements of Deductive Logic* (1867, 10th ed., 1892); *The Elements of Inductive Logic* (1870, 6th ed. 1892); *Locke*, in "English Men of Letters" (1880); *Bacon's Novum Organum* (1889); *Locke's Conduct of the Understanding* (3d ed. 1890); *Francis Bacon* (1881) and *Shaftesbury and Hutcheson* (1882), in "English Philosophers Series"; *History of Corpus Christi College* (1893); *Progressive Morality: An Essay in Ethics* (1895). He was also joint author with J. M. Wilson of *Principles of Morals* (1885-87).

FOWLER'S SOLUTION. See Arsenic.

FOWLING. See Hunting.

FOX (AS. *fox*, OHG. *fuhs*, Ger. *Fuchs*, fox, Goth. *fauhō*, vixen; possibly connected ultimately with Skt. *puccha*, tail). A member of a group or 'alopecoid series' of canine animals, more easily distinguished from the wolves, dogs, or jackals of the same family (Canidæ) by outward appearance than by zoölogical differences. They are, in general, of smaller size and less proportionate height; have longer hair, usually more reddish or yellowish than gray; larger, more triangular and furry ears; a more slender pointed muzzle, with straighter jaws; and a longer and more bushy tail, than their allies. Some zoölogists refuse to separate them even as a genus, but most students place them in the genus Vulpes, and still further separate the American gray fox as Urocyon, and the little African long-eared foxes as Fennecus. The anatomical characters upon which Vulpes is distinctly based are principally found in the skull, where "the bony projection forming the hinder border of the socket of the eye is regularly curved downward and has a convex upper surface" in the wolves and jackals; "whereas in the fox the same process is hollow above, and has a more or less marked tendency to curve upward behind"; also, the air-chambers in the frontal bones of the wolves are absent in the foxes. Another constant distinction is found in the pupil of the eye, which, when contracted, is round in the dog-like canines and elliptical in the foxes. The true foxes (apart from the African fennecs) are scattered throughout all the northerly regions of the world, from the edge of the tropical zone to the highest Arctic lands, but none are known in the Southern Hemisphere. The number of species is indeterminate, conservative naturalists regarding as local varieties various forms to which others give specific names.

All inhabit holes in the earth, usually of their own digging, but do not hibernate, are nocturnal, and subsist mainly upon animal prey which they capture by stealthy approach and a quick rush; and all utter yelping cries, and breed annually. They are believed not to have contributed in any appreciable degree to the ancestry of any race of domesticated dogs, and although everywhere highly intelligent in their field of thought, are rarely tamed as pets or trained to perform tricks well. The typical and best-known species is the European red fox (*Vulpes vulgaris*), the hero of British fox-hunting (see Fox-Hunting), and the *renard* or *Reinicke Fuchs* of European folk-lore. (See Colored Plate of Canidæ.) It is spread over the whole of Europe and Asia, and is also found in Asia Minor and along the south shore of the Mediterranean. The ordinary type, familiar in Great Britain and western Europe, is reddish brown above and white below, with the outer portions of the ears and feet black, and the tip of the 'brush,' or tail, white. Its length may vary from 27 to 46 inches, exclusive of the tail, which is itself from 12 to 15 inches long. Colors and markings vary greatly, however, as well as size and proportions. The habits of the common fox in England are thus sketched by Lydekker and Bell, and the essential facts apply to the animal in all parts of its range:

"Although the fox is by no means averse to taking possession of the deserted burrow of a rabbit or a badger, it generally excavates its own 'earth,' in which it spends a considerable portion of its time. As all hunters know, foxes frequently prefer to live out in the woods, those with a northern aspect being, it is said, generally avoided. Sometimes these animals will prefer a thick hedgerow or a dry ditch, while we have known them to select the tall tussocks of coarse grass in swampy meadows as a resting-place; and they have also been found in straw-ricks, where it is on record that in one instance cubs have been born. The breeding time is in April, and the usual number of young in a litter is from four to six. The prey of the fox consists, writes Bell, 'of hares, rabbits, various kinds of ground birds, particularly partridges, of which it destroys great numbers; and it often makes its way into the farmyard, committing sad havoc among the poultry. It has been known not infrequently to carry off a young lamb. When other food fails, the fox will, however, have recourse to rats and mice, and even to frogs and worms; while on occasion beetles are largely consumed, and on the seashore fish, crabs, and mollusks form a part of its diet. Carrion seems never to come amiss, while the old story of the fox and the grapes alludes to the fruit-eating propensities of these animals.' The usual cry of the fox is a yelping bark. The well-known scent of the fox is secreted by a gland situated beneath the tail. The cunning exhibited by English foxes in escaping from hounds has been so often described that we shall make no further allusion to it here, beyond saying that it has probably attained its present development as the result of the inherited experience of many generations. The life of the fox is a precarious one; the huntsman is his friend and the gamekeeper his foe; and were he not specially protected for the sport he gives to hounds and men, he would, like the wolf, have long since been extinct in England. That the fox is an ancient inhabitant of the British Islands is proved by the occurrence of its fossilized remains in caverns in company with those of the mammoth and other extinct animals. This, however, is not all, for a skull . . . has been dug up from the sands lying at the top of the Red Crag of Suffolk, which are vastly older than the mammoth period."

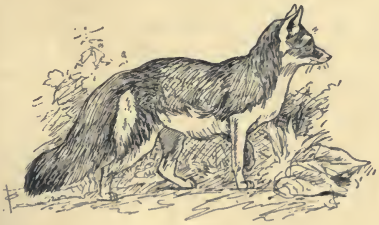
As the Old World fox is traced eastward distinct local varieties are encountered, which, however, intergrade. Thus a black-bellied fox is characteristic of southern Europe, and is decidedly different from the ordinary colors of the North African variety. The dry plains of western Asia support a paler form, and this is succeeded eastward by two much larger types of the eastern and western Himalayas, which, in winter, when the coat is long and the colors are heightened, are extremely handsome; a characteristic marking among these is a dark stripe athwart the shoulders. Siberia, China, and Japan likewise have varieties of this same one species, which, if the American red fox be also included, ranges throughout almost the entire Northern Hemisphere, and has the most extensive distribution of any of the Canidæ. Asia possesses some other very distinct species of foxes, nevertheless, of which the most familiar is the small, alert, and pretty Indian fox (*Vulpes Bengalensis*) to be met with all over Hindustan, except in thickly forested regions. It is rarely hunted by scent, with foxhounds; but frequently affords good sport by coursing with greyhounds. Three other species of 'desert' foxes, all pale and yellowish in hue, belong to the open sandy plains and tablelands between Arabia and Afghanistan. One of these is the widely spread desert fox (*Vulpes leucopus*); another, the better-known corsac (q.v.), and the other varieties inhabit Thibet and Afghanistan. The earliest fossil remains of distinctly canine beasts are fox-like animals of the Middle Tertiary period.

American Foxes. Several species of fox are characteristic of North America. The most widespread and conspicuous is the red fox, called by American zoölogists a distinct species (*Vulpes Pennsylvanica*), but regarded by European students as a local phase of the circumpolar 'common' fox, heretofore described. It is hard to distinguish it in the normal type from the European fox, though the colors are, on the average, rather brighter; and it varies on our continent quite as diversely as does the fox of the Old World. The normal red fox remains common in spite of the civilization of the country throughout the eastern United States and Canada, westward to the Plains, as far south as northern Georgia; and reappears west of the Rocky Mountains and thence to the Pacific Coast in a paler large-tailed form. In the far north occur more rarely two other varieties—the cross fox and the silver fox. The former is simply a more or less normal red fox, marked sometimes strongly, sometimes indefinitely, with a dark cross on the back and shoulders, fine specimens of which are given a superior value by traders in peltries. The latter, or silver fox (var. *argentata*), is much rarer, and is black, with a silvered or hoary appearance due to many of the hairs being tipped with white; the tail is black with a white tip, and the soles of the feet are hairy, fitting it for life amid ice and snow. Good pelts of the silver fox are extremely valuable. That both these are merely phases of the red fox is plain from the fact that they may be born in the same litter with normally red cubs. Foxes totally black also occur frequently in the Hudson Bay region. The American red fox had originally much the same habits as those of the European animal, seems to be deserving of quite as much credit for sagacity and acuteness, and has learned to accommodate itself as well to the exigencies brought by civilization and the chase. The writings of American naturalists and sportsmen abound in interesting stories of its alertness, ingenuity, and adaptiveness, and show that it has spread and survived in the United States, where the gray fox has diminished.

A small grayer species of the southern California coast (*Vulpes macrotis*) is conspicuously distinguished by its great ears.

The Kit, Swift, or Burrowing Fox (*Vulpes velox*) is a well-marked species of the dry plains of the United States, whose range extends from Colorado and Nebraska north to the Saskatchewan Valley. It is small, only about 20 inches long, slender and compact in form. Its color is yellowish-gray on the upper surfaces, fading through reddish to white on the belly and legs, and there is a black patch on each side of the muzzle. The ears are short and densely furred, and the soles of the feet are overgrown with long woolly hair, like those of the Arctic fox. It digs burrows with skill and speed, feeds upon small rodents, insects, small birds and their eggs, etc.,

FOXES AND JACKALS



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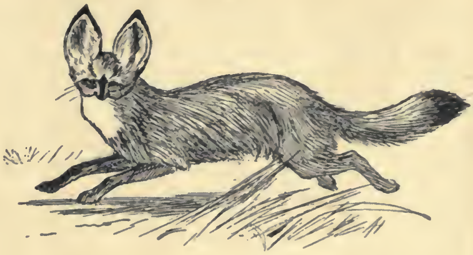

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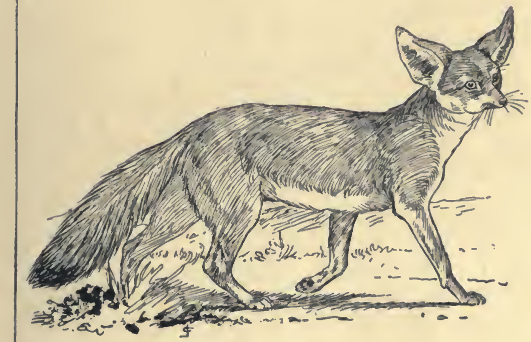

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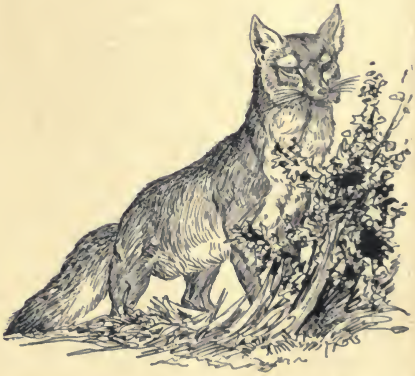

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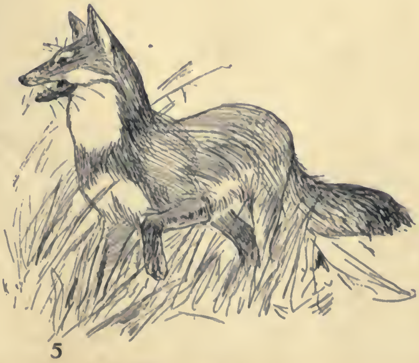

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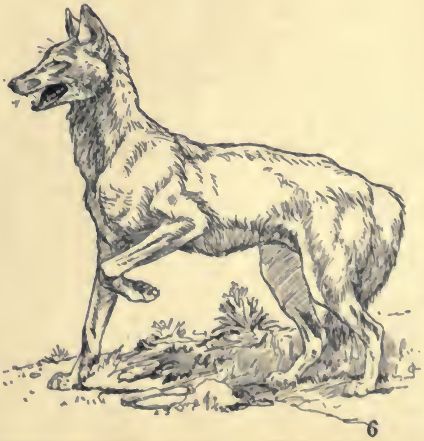

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1. KIT FOX (Vulpes velox).
2. LALANDE'S FOX-DOG (Otocyon Lalandii).
3. FENNEC (Canis zerda).
4. CORSAC (Canis corsac).
5. GRAY FOX (Urocyon cinereo-argentatus).
6. JACKAL (Canis aureus).

and is remarkably swift of foot and dexterous in hiding. Its fur becomes thick in winter and pale gray in color, rendering it nearly invisible. See Plate of FOXES AND JACKALS.

The Blue or Arctic Fox (*Vulpes lagopus*) is one of the most interesting of all the species. It is known all around the Arctic shores, and in summer is a variable brown (even sooty in some cases) on the upper parts, and yellowish-white on the ventral surfaces, throat, etc.; the under fur, however, is everywhere dull blue. This bluish tint frequently appears in the summer dress in patches in the foxes of all regions; but in those of the Aleutian Islands and southeastern Alaska it characterizes the whole pelage, and gives the name 'blue' fox to the animal in that region. E. W. Nelson, who describes it at length in his *Natural History of Alaska* (Washington, 1887), concludes that this is the typical, original form, from which the brownish and blackish foxes elsewhere are variants. The blue foxes remain of that color all winter, putting on a longer, thicker coat as cold weather approaches; but elsewhere all the Arctic foxes become purely white about October, and remain so until spring, rendering them almost invisible upon the snow and aiding them to steal upon their prey. They are animals of the open country and seacoast, and in winter they often visit the Eskimo villages or come close to their camps, and are easily trapped. "Parts of the country," says Nelson, speaking of Alaska, "where rocky ledges occur, are especially frequented by them, as the crevices among the rocks give them welcome shelter. During summer they fare sumptuously upon the breeding waterfowl, eggs, and young birds, which are found everywhere, but in winter comes harder work, and the ground is carefully searched for stray mice, lemmings, or an occasional ptarmigan. In early spring, toward the end of March, when the seals begin to haul up on the ice and the first young are born, thousands of these foxes go out seaward and live upon the ice the rest of the season. The young seal's offal, left by hunters and from other sources, gives them more food there than the shore affords at this time." It may be added to this that Feilden, who was with the Polar expedition of Nares, *A Voyage to the Polar Sea* (London, 1878), found that in Grinnell Land these foxes subsisted in winter largely upon stores of frozen lemmings, etc., which they had hidden in crevices of rocks or had buried in the ground. The fur of this fox is very valuable, and most of all that of blue foxes of the Aleutians, where they are now to a certain extent protected, not only, but where they have been colonized upon certain islands, and are being bred and provided with food as a regular fur-raising industry. See ALASKA; and Colored Plate of CANIDÆ.

The Gray Fox is a species (*Urocyon argenteus*) of the United States, which is generally separated from other foxes by cranial peculiarities, and by the fact that the tail has a concealed mane of stiff hairs. The general coat is silver-gray above and whitish on the under parts, but the chin and a patch on the nose are black, and the base of ears, patch at side of neck, collar on throat, interior surface of fore legs, and a broad band along the belly are cinnamon rufous. The size is about the same as that of the red fox, but the hair is stiffer and less admirable as a pelt. This species is generally distributed over the United States, but in the West differs locally so much from the Eastern type that no less than five subspecies have been named. It is accustomed to life in the forests rather than in open country, and has unusual ability in tree-climbing; but it seems to be less adaptive than the red fox, and has almost disappeared from the thickly settled and much-cleared Northern and Eastern States. See Plate of FOXES AND JACKALS.

Consult: for Old World foxes, Bell, *British Quadrupeds* (2d ed., London, 1874); Mivart, *Monograph of the Canidæ* (London, 1890); Brehm, *Thierleben* (Leipzig, 1876), English translation by Pechnel-Loesche and Haacke (Chicago, 1894-96); Blanford, *Fauna of British India: Mammalia* (London, 1889-91); and general works. For American foxes, Richardson, *Fauna Boreali Americana* (London, 1829); Audubon and Bachman, *Quadrupeds of North America* (New York, 1851); Merriam, *Transactions of the Linnæan Society of New York*, vol. i. (New York, 1882); Burroughs, *Winter Sunshine* (New York, 1876); Cram, *Little Beasts of Field and Wood* (Boston, 1889); and general works upon Alaska and the Arctic Coast.

FOX, or MUSKWAKI. An Algonquian people, best known as confederates of the Sauk (q.v.). They were called foxes (*Renards*) by the French, possibly because of having a Fox clan; but call themselves Muskwakiuk, 'red-earth people.' When first known they lived in central Wisconsin, having been driven from Lake Superior by the Ojibwa, whose continued inroads, together with a disastrous war with the French, finally compelled them to incorporate about 1760 with the Sauk, with whom they have ever since been so intimately connected that the two tribes are now practically one, their combined population being about 930.

FOX, THE. See VOLPONE.

FOX, CAROLINE (1819-71). An English diarist. She was born at Falmouth, of a Quaker family that for two centuries had been prominently identified with Cornwall. Her father, Robert Were Fox, was the inventor of the deflector dipping needle, and his genial qualities drew around him many famous persons of his day. Miss Fox has graphically sketched their character and conversations in her posthumous *Memories of Old Friends, Being Extracts from the Journals and Letters of Caroline Fox* (1882). Especially interesting are the accounts of the conversations between John Stuart Mill and her brother, Barclay Fox. Her portraitures are characterized by appreciativeness and sympathy, while her style is almost uniformly buoyant and entertaining.

FOX, Sir CHARLES (1810-74). An English engineer. He was born at Derby, and after serving as apprentice to Captain Ericsson, entered the service of Robert Stephenson. He was subsequently a member of the firm of Fox, Henderson & Co., and after 1857 confined himself to private practice as consulting engineer. The numerous works designed and constructed by him include the tunnel at Watford, the railroad between Camden Town and Euston Square, the bridges over the Thames, the Shannon, and the Saône at Lyons. He was one of the principal railroad builders in Great Britain, and also constructed roads in Denmark, France, Switzerland, Canada, South Africa, and India, where he introduced the narrow gauge. The introduction of the switch in place of the sliding rail previously in use is also due to him. He also built the Crystal Palace in London.

FOX, Charles James (1749-1806). A celebrated English statesman and orator. He was the second son of Henry Fox, first Lord Holland, and Lady Georgiana Carolina, who was the eldest daughter of the Duke of Richmond and the great-granddaughter of Charles II. He was born on January 24, 1749, was educated at Eton and Oxford, and his education was completed by two years of travel on the Continent.

On his return to England in 1768, although he was not yet of age, he was returned to Parliament through the influence of his father, beginning his career as a Tory. His talent as a debater won him a place in Lord North's Ministry, which he entered in 1770 as Junior Lord of the Admiralty. In 1773 he was made a Lord of the Treasury, but was dismissed in the following year because of his opposition to the King's favorite marriage bill and a useless humiliation inflicted upon Lord North. The years that followed may be described as a conflict between the King, through his Minister, Lord North, and the brilliant Fox. He was the most formidable opponent of the war with America, even foreseeing the necessity and advantages of a complete separation. On the downfall of Lord North in 1782, notwithstanding the King's opposition, he was made Foreign Secretary in the Whig Ministry of Rockingham. He supported Pitt's motion for Parliamentary reform, and granted to Ireland complete legislative independence. His masterful plan for the separation of French and American interests in the peace negotiations of Paris was circumvented by Shelburne, the Home Secretary. As a consequence he resigned his office when Shelburne became Premier on the death of Rockingham. Forming a coalition with Lord North and the Tories, he defeated Shelburne and resumed his old position as Foreign Secretary, but the personal influence of the King secured the rejection by the Lords of his East India bill, which vested the government of India in a commission appointed by Parliament.

What may be called the second period of the Parliamentary career of Fox was occupied by his long struggle with Pitt. He alone, of all the famous English statesmen of his day, favored the French Revolution, and was opposed to the ruinous wars with France. The total abolition of the slave trade, the removal of the political disabilities of both the Dissenters and the Catholics, were repeatedly urged by him. He gave powerful aid in the impeachment of Warren Hastings, and in 1792 he secured the passage of his Libel Act, which as a measure for personal liberty is second only to the Habeas Corpus Act in importance. When Pitt died (1806), Fox became Foreign Secretary in the Ministry of All the Talents; but he did not live to see either the slave trade abolished or his peace negotiations with France carried out. He died in his fifty-eighth year, on September 13, 1806.

Fox was better qualified to lead an opposition than to govern an empire, for he lacked the tact and self-restraint necessary for managing Parliamentary majorities and conciliating a headstrong king. He was one of the most brilliant and interesting figures of the eighteenth century. He had the vices of his day, but these were counterbalanced by his unfailing honesty and genial and kindly disposition. His vices he owed in a large measure to his father, a notoriously corrupt politician who deliberately made of him a gamester. He did not allow the faults of his private life to interfere with the strict performance of his Parliamentary duties, and whenever he was in office he relinquished them altogether. He was a man of fine literary taste, and among his friends were the poet Rogers, Gibbon the historian, and Dr. Johnson. Of his own literary efforts, the most important was a *History of the Reign of James II.* (1808), left incomplete at the time of his death. The work is of little value from either a scientific or a literary standpoint.

Consult: Wright, *Speeches of the Rt. Hon. Charles J. Fox in the House of Commons* (London, 1815); *Memorials and Correspondence of Charles James Fox,* edited by Lord John Russell (London, 1853), being materials collected by Lord Holland, his favorite nephew; Lord John Russell, *The Life of C. J. Fox* (London, 1859-66); Walpole, *Recollections of the Life of Fox* (London, 1806); Trevelyan, *Early History of Charles James Fox* (New York, 1881); Trotter, *Memoir of the Latter Years of Fox* (Baltimore, 1812); Wakeman, *Life of Charles James Fox* (London, 1890), in the Statesmen Series; Lecky, *History of England in the Eighteenth Century,* vols. iii.-vi. (London, 1882-87).

FOX, Edward, Bishop of Hereford (1496-1538). An English ecclesiastic, born at Dursley, Gloucestershire, and educated at Eton and at King's College, Cambridge. He became secretary to Wolsey, who sent him as an envoy to Rome (1528), for the purpose of gaining Papal sanction to Henry VIII.'s first marriage. Brought thus into royal notice, Fox was sent upon numerous diplomatic errands to France and elsewhere, and rose rapidly in his profession till he became Bishop of Hereford (1535). He was the main mover in Henry's divorce of Katherine and marriage with Anne Boleyn, and was regarded as a pillar of the Lutheran faith. He is credited with the epigram, "The surest way to peace is a constant preparedness for war," and his most important work is *De Vera Differentia Regiæ Potestatis et Ecclesiæ* (1534), of which an English translation was made in 1548.

FOX, George (1624-91). The founder of the Society of Friends, or Quakers. He was born at Fenny-Drayton, Leicestershire, July, 1624. His parents were in good circumstances, but it is doubtful if he had any schooling. He was apprenticed to a shoemaker; but when about nineteen came to believe himself the subject of a special divine call and took to wandering in solitude through the country, absorbed in religious reveries. His friends induced him to return home; but he stayed only a short time, and finally adopted the career of an itinerant religious reformer. About 1646 he left off attending church for worship. His first efforts at preaching were made at Dukinfield, Cheshire, in 1647, and at Manchester. He first attracted general attention in 1649, by rising in the principal church at Nottingham during the sermon and rebuking the preacher for declaring the authority of the Scriptures to be the source of divine truth. "No," cried Fox, "it is not the Scriptures; it is the Spirit of God." This audacious act led to his immediate imprisonment. On his release he repeated his protests elsewhere. The excitement caused was very great, and Fox was frequently imprisoned as a disturber of the peace. He gained followers, who first received the name Quakers in 1650. According to Fox's *Journal*, it was given by Justice Bennet, of Derby, because Fox had bidden the magistrates to "tremble at the word of the Lord." In 1655 he was examined in London before Cromwell, who pronounced his doctrines and character irreproachable. Nevertheless he had a hard struggle, was constantly vilified, and frequently imprisoned by country magistrates. His followers increased in large numbers. They were naturally visionaries, mystics, and fanatics, and their extravagances did much to bring the body and its founder into discredit. It is no small item in Fox's favor that he succeeded in moderating their excesses and introducing discipline and organization among them. He had much help from Margaret, widow of Judge Fell, of Swarthmoor Hall, Lancashire, whose house became the headquarters of the Quaker movement. Although ten years older than Fox, they were married in 1669. Fox traveled unremittingly, preaching his doctrines. In 1671-72 he visited the West Indies and the continent of North America, and twice he went to Holland. Of his many imprisonments, the longest was at Lancaster and Scarborough, in 1663-66, and the last in Worcester jail, for nearly fourteen months, in 1673-74. He died in London, January 13, 1691. Fox was not a man of broad and philosophic genius, and his writings are marked by a poverty of intellect and sentiment. He won his success by earnestness and persistence, continually insisting upon a few leading doctrines, such as the futility of learning for the work of the ministry, the presence of Christ in the heart as the 'inner light,' the necessity of trying opinions and religions by the Holy Spirit, and not by the Scriptures, and the doctrine of 'non-resistance.' He was a man of winning personal manners and strong and sound moral nature. His peculiarities of dress have been exaggerated, and were adopted from a desire for simplicity rather than eccentricity. The fullest collection of his writings is the Philadelphia edition, in eight volumes (1831). The best known is his *Journal* (1634; new ed. 1902). Consult: Tallack, *George Fox, the Friends, and the Early Baptists* (London, 1868); Bickley, *George Fox and the Early Quakers* (London, 1884); Smith, *Descriptive Catalogue of Friends' Books* (London, 1867); Beck, Wells, and Chalkley, *Biographical Catalogue* (London, 1888). There are many biographies, among which those of Marsh (London, 1847), Jenney (Philadelphia, 1853), and Watson (London, 1860) may be mentioned. See FRIENDS.

FOX, GEORGE L. (1825-77). An American comedian, born in Boston. He made his first appearance at the Tremont Street Theatre, in that city, at the age of five. Soon after his arrival in New York, where he played for some time at the National Theatre in Chatham Street, he became popular as a low comedian. In the Civil War he served as a lieutenant in the Eighth New York Infantry. Inspired by the famous Ravel Brothers to undertake pantomime, he created a distinct place for that kind of entertainment in New York City, first at the National Theatre and later at the New Bowery, of which he was for a time lessee and manager. His principal rôle was that of the clown in *Humpty Dumpty*, and no one has ever equaled him in this character, which he may be said to have created. He was scarcely less distinguished in his burlesques on the famous tragedians of the day, and his resemblance to Booth in the character of Hamlet was remarkable.

FOX, GUSTAVUS VASA (1821-83). An American naval officer. He was born in Saugus, Mass., entered the United States Navy as a midshipman in 1838, served eighteen years, participating in the war with Mexico, and retired with the rank of a lieutenant in 1856. He was engaged in the wool-manufacturing business at Lawrence, Mass., from 1856 to 1861. Early in the latter year he was consulted by General Scott in regard to sending a relief expedition to Fort Sumter, and an expedition was actually planned; but President Buchanan refused to allow the plan to be carried out. After the inauguration of Lincoln, however, it was put into operation. Fox was first sent to confer with Major Anderson, and upon his return was commissioned to fit out a relief expedition at New York. Fox, with part of his ships, arrived off Charleston Harbor on the morning of the bombardment; but through an order which had detached the principal vessel of his fleet and sent it to Fort Pickens, he found himself unable to render aid. On his return North, Fox was appointed Assistant Secretary of the Navy, a position which he held throughout the war. To him is to be credited the plan for opening up the Mississippi, for the capture of New Orleans, and the selection of Farragut for high command. In 1866 he was sent to Russia on a special congratulatory mission to the Czar, Alexander II., who had just escaped assassination. While in Saint Petersburg he took part in the negotiations which resulted in the purchase of Alaska. Upon his return to America he again entered the wool-manufacturing business at Lowell, from which he had retired on the outbreak of the war. Consult Loubet, *Narrative of Fox's Mission to Russia in 1866* (New York, 1873).

FOX, HENRY, Baron HOLLAND (1705-74). See HOLLAND.

FOX, HENRY EDWARD (1755-1811). An English soldier, the younger brother of Charles James Fox. After a brief education at Westminster School, he entered the King's Dragoons in 1770. Three years later he was made lieutenant of the Thirty-eighth, quartered in Boston. He served at Concord, Bunker Hill, Long Island, White Plains, Brandywine, and Philadelphia, and in 1777 was made major and a year later lieutenant-colonel of the Forty-ninth Regiment, and with it saw service in the West Indies. In 1783 he returned to England, and was made aide-de-camp by the King, who took a great fancy to him. Major-general in 1793, he commanded a brigade at Roubaix and Mouveaux, and at Pont-à-Chin (1794) beat back a French army. In 1801 he was sent to Minorca, and stayed there until 1803, when he went to Ireland as commander-in-chief, and was badly frightened by the feeble rebellion under Emmet. In the next year he was made Lieutenant-Governor and actual commander of Gibraltar, and in 1806, on the accession of the

Ministry of All the Talents, was appointed Ambassador to Naples and commander of the forces in Sicily; but he accomplished little there, because of the quarrel with the Neapolitan Court which grew out of his unwillingness to risk all in an attempt to drive the French out immediately. In 1807 he was recalled by the new Ministry, after his brother's death, and subsequently was made general (1808) and Governor of Portsmouth (1811). He married Marianne Clayton (1786), and had two daughters and one son, Henry Stephen (1791-1846), who was Minister to the United States (1835), and did much to promote the success of the Ashburton Treaty.

FOX, JOHN (1863—). An American novelist, noteworthy for vivid description of life in Kentucky, his native State, of whose mountain dialect he is master. He was born in Bourbon County, Ky., in 1863, and was graduated from Harvard in 1883. After some experience in journalism, he traveled in Southern States and California, and afterwards engaged in business at Cumberland Gap, where he had ample opportunity for the study of mountain life. He wrote: *A Mountain Europa; A Cumberland Vendetta* (1895); *The Kentuckians; Crittenden* (1900), a novel of the Cuban War; and *The Little Shepherd of Kingdom Come;* also two volumes of short stories—*Hell fer Sartain, and Other Stories* (1897), and *Blue Grass and Rhododendron* (1901).

FOX, LUKE (1586-1635). An English navigator. He was born at Hull, and went to sea at an early age. On April 30, 1631, he sailed from London to search for a northwest passage. The results of his explorations were subsequently embodied in the work entitled *Northwest Fox; or, Fox from the Northwest Passage* (1635), a work which contained a most interesting map of the Arctic regions as then known. He made an extensive exploration of the western shore of the land now named after his predecessor, Baffin, and discovered Cumberland Island and other points along Hudson Strait. The far northern channel through which he passed has been named after him.

FOX, MARGARET (1836-93). An American spiritualist, born at Bath, Canada. At Hydeville, Broome County, N. Y., about 1848, there were heard in the Fox residence rapping noises which appeared to proceed from the walls and furniture. Margaret and her two sisters, Catharine and Leah, discovered that by means of a given code communication could be established with the presumably supernatural agency by which the raps were produced. The sisters gave public séances in America and Europe, the chief features of which were the spirit rappings and the moving of large bodies by invisible means. So-called 'mediums' became numerous, and the investigation of spiritualistic phenomena interested many. From the first, however, scientific minds discredited the claims of the sisters. In 1888 Margaret made a confession of imposture, later retracted. See SPIRITUALISM.

FOX, RICHARD. See FOXE.

FOX, WILLIAM JOHNSON (1786-1864). An English Unitarian preacher, orator, and political writer. The son of a peasant farmer, he was born at Uggeshall Farm, Wrentham, Suffolk, March 1, 1786. His father removed to Norwich, where he pursued various callings, and Fox, after primary education at a chapel school, and working as an errand boy and weaver's help, became a banker's clerk. He devoted his leisure to self-improvement in arts and languages, and presently was sent to Homerton Independent College for ministerial training. He subsequently seceded to Unitarianism, and in a London charge became celebrated as a rhetorician and the most eloquent exponent of English rationalism. An unfortunate marriage and separation led to his resignation from the ministry, and he devoted himself to literature and public speaking. In the interests of free trade and the Anti-Corn Law League he thrilled enthusiastic popular audiences with his oratory. From 1847 to 1863 he represented Oldham in Parliament, as an advanced Liberal. His speeches in that critical assembly did not equal the success of his platform orations; but he soon acquired general respect by his tact and discretion. His best Parliamentary addresses were in favor of public education and the extension of the franchise. He was the first contributor to *The Westminster Review*, he was editor of *The Monthly Repository* for many years, and he contributed copiously to other organs of public opinion. His *Lectures of a Norwich Weaver Boy* and *Lectures to the Working Classes* had an extensive and popular circulation, and did much to effect the reforms they advocated. *Religious Ideas* is his most important theological work. His voluminous writings, sermons, and orations are collected in the memorial edition of his works (London, 1865-68). He died June 3, 1864.

FOX-BAT. Any large fruit-eating bat, or 'flying fox,' of the family Pteropodidæ, esteemed the lowest in rank of the Chiroptera. There are some seventy species, inhabiting Africa, India, China, Japan, and the Malay Archipelago, where they especially abound. Most are of large size, are tailless, have small, pointed ears, large eyes, noses free of lobes, and those of the type-genus much resemble in physiognomy, size, and color the foxes after which they are named. A Javan species spreads its wings five feet, and is eaten by the natives. These bats are wholly frugivorous, nocturnal, gregarious, and do great damage where numerous, especially to cocoanut and mango plantations. A strong musky odor pervades, at night, the vicinity of their assemblies, and one credible writer asserts that the flying foxes are fond of drinking palm toddy from the chatties left out overnight. An African genus of this family supplies the common Egyptian bat, which flocks in the chambers of the pyramids and other tombs, and is figured on the monuments; it is *Xantharpia Ægyptiaca.* An Austro-Malayan genus is termed Harpia, in reference to the supposition that a bat of this sort is the basis for the harpies of classic mythology. Consult Wallace, *Malay Archipelago* (New York, 1869). See FRUIT-BAT.

FOX CHANNEL. A northern reach of Hudson Bay, Canada, inclosed on the west by Southampton Island and Melville Peninsula, and on the east by Fox Land and Baffin Land (Map: Canada, P 3). It has a southeast outlet through Hudson Strait, and a northwest outlet through Fury and Hecla Strait. It was named after Luke Fox, who explored Hudson Bay in 1631.

FOX DEITY AND FOX-POSSESSIONS. In Chinese Asia, popular belief ascribes to the fox extraordinary powers, and the ability to assume human or any shape, but generally that of beautiful women, and to work all kinds of mischief, especially in love affairs. Possession by the spirit of a fox is so thoroughly believed in that a standard source of revenue for Buddhist priests of certain sects is in practicing exorcism from their suffering patients, usually women. The foxes in their various transformations appear to the good or evil with rewards or punishments in quite the orthodox story-book style. In Japan the fox is the attendant on the food god, Inari (Rice-bearer, or Rice-man), and myriads of effigies of the creature in white or colored material, usually stone, may be seen near the Inari shrines. Giles tells us that "in some parts of China it is customary for mandarins to keep their seals of office in what is called a 'fox chamber'; but the character for fox is never written, the sight of it being supposed to be very irritating to the live animal. A character which has the same sound is substituted, and even that is divided into its component parts, so as to avoid the slightest risk of offense. This device is often adopted for the inscriptions on shrines erected in honor of the fox." Consult: Pfoundes, *Fu-So Mimi Bukoro* (Yokohama, 1875); Mitford, *Tales of Old Japan* (London, 1876); Chamberlain, *Things Japanese* (London, 1892); Griffis, *The Mikado's Empire* (New York, 1900).

FOX-DOG. A book name for a group of small South American canine animals, on account of their somewhat fox-like aspect. The group was defined by Mivart, *Proceedings of the Zoölogical Society of London* (London, 1890), as including five species, as follows:

Crab-eating fox-dog (*Canis cancrivorus*), Brazil.
Short-eared fox-dox (*Canis microtis*), Brazil.
Azara's fox-dog (*Canis Azaræ*), Brazil to Tierra del Fuego.
Small-toothed fox-dog (*Canis parvidens*).
Black-tailed fox-dog (*Canis urostictus*), Brazil.

These animals are much alike in their foxy appearance, though rather larger in size, and having a more variegated and highly variable coat, often handsomely marked with black and dark red, than any true fox. The crab-eating fox-dog is common throughout the forested parts of the whole Amazon basin, and gets its name from its fondness for crayfish, though these crustaceans form only a part of its fare. They often collect in packs and run down deer. Azara's dog (see Plate of WOLVES AND DOGS) is known throughout the whole continent east of the Andes, on the pampas and bleak shores of Patagonia (where it is called colpeo), as well as in the forests of Brazil and Guiana. It has much the habits of the North American coyote, but resorts to jungles and forests much more readily. Everywhere it is fox-like in its fondness for poultry, and in Paraguay it is said to destroy a great amount of sugar-cane while eating only a little. The small-toothed species takes its name from the diminutive size of the fourth premolar, and of the short-eared dog almost nothing is known. Consult Hudson, *The Naturalist on the La Plata* (London, 1892).

FOXGLOVE. The very inappropriate name of a genus (*Digitalis*) of about 18 species of beautiful half-hardy herbaceous biennial plants of the order Scrophulariaceæ. The erect stems, which bear numerous large leaves at their bases, terminate in long racemes of inflated campanulate flowers, of various colors and markings. Individually foxgloves are attractive, and in masses they give character to the flower border. They succeed well in light, rich soil, not too dry in either exposed light or in partial shade. When once established, they will reproduce sufficient plants from seed to keep the border stocked. One species, credited with diuretic, sedative, and narcotic properties, is officially listed in dispensatories under the name Digitalis (q.v.).

FOXGLOVE.
(*Digitalis Purpurea.*)

FOXE, JOHN (1516-87). The English martyrologist. He was born in 1516, at Boston, Lincolnshire. In 1523 he entered as a student at Oxford; in 1537 he took his bachelor's, and in 1543 his master's degree, and was elected a full fellow of Magdalen College (1539). He displayed at an early period an inclination for Latin poetry, and wrote several plays in that language upon scriptural subjects. Of these, the only one that remains, entitled *De Christo Triumphante*, was first printed at Basel in 1556. The religious movements of the times led him to study the great controversy between the Old Church and Protestantism, and becoming a convert to the principles of the Reformation, on July 22, 1545, he resigned his fellowship. In 1546 he married, and coming to London for employment, he attracted the notice of the Duchess of Richmond, and through her influence became tutor (1548) to the children of her brother, the Earl of Surrey, then a State prisoner in the Tower. On June 23, 1550, he was ordained deacon by Ridley, Bishop of London, and preached the doctrines of the

Reformation at Reigate. In 1553, when Mary came to the throne, he was dismissed by the Catholic grandfather of his pupils, and fearing persecution for his religious opinions, he fled to the Continent. On the accession of Elizabeth, he returned to England in October, 1559; was ordained priest 1560, and in May, 1563, he was made a prebendary in Salisbury Cathedral and Vicar of Shipton. He also held the living of Cripplegate, which he soon resigned, and for a year (1572-73) he held a stall at Durham. In 1575, when some Dutch Anabaptists were condemned to the flames in London, Foxe interceded for them with Elizabeth and other persons in authority, but without effect. He wrote numerous controversial and other works, but the one that has immortalized his name is his *History of the Acts and Monuments of the Church*, popularly known as *Foxe's Book of Martyrs*, the first draft of which was published at Strassburg in 1554. The first English edition appeared in 1563. Sanctioned by the bishops, it was ordered, by a canon of the Anglican convocation, to be placed in every cathedral church in England, and has gone through innumerable editions. It is not a critical work, as might be supposed, and Roman Catholics deny its trustworthiness. The best editions are by Cattley, with introduction by Townsend (London, 1843-49); Mendham and Pratt (8 vols., ib., 1853); and by Stoughton (London, 1877). Foxe died in London, April, 1587, and was buried in the chancel of Saint Giles's, Cripplegate, London. There is no satisfactory life of Foxe; the first issued (1641) was very unreliable; the nearest approach to correctness is that revised by Pratt (London, 1870).

FOXE, or **FOX**, RICHARD (c.1448-1528). An English prelate and statesman, born at Ropesley and educated at Oxford. He left Oxford because of the plague, and studied for a short time at Cambridge, and then went to Paris. There he made the acquaintance of Henry of Richmond, and helped him get money and men from the French King for his invasion of England. After the accession of Henry VII., Foxe was one of the King's most trusted advisers, and became Secretary of State, Privy Seal, and Bishop of Exeter. He was sent to Scotland as Ambassador several times, negotiated a treaty between England and Scotland in 1487, and again in 1497, after a stout defense of his castle in Durham. In the interval he had been a signer of the Treaty of Etaples (1492), and commissioner on the *Intercursus Magnus*, a treaty with Philip of Austria (1496). In 1498 and 1499 he treated with the Scotch King, and made arrangements for his marriage with the Princess Margaret. In the following year he was chosen Chancellor of Cambridge, and was Master of Pembroke (1507-19). Under Henry VIII. his political influence gradually diminished. He retired from the Court in 1516, and became blind a few years after. But his last years were spent well; he founded free schools at Taunton and Grantham, and at Oxford, Corpus Christi College (1516). The story that Wolsey urged him to resign his bishopric to him, and that Foxe refused, has little authority. Foxe may have had a share in the writing of *Contemplacyon of Synners* (1499). He edited a *Processional* (1508); and translated the *Rule of Saint Benedict* (1517).

FOXHOUND. A small hound, trained to the pursuit of the fox. See HOUND; FOX-HUNTING; and Plate of DOGS.

FOX-HUNTING. There are various fashions of hunting the fox. In England, the home of fox-hunting, he is pursued by carefully bred packs of hounds ranging in number from twenty-five to forty couples, who are put by the huntsmen into a covert or wood, where it is known, or thought, the fox has his earth. He would elude the hounds almost invariably were it not for the scent left in the air along his track. One or another hound is sure to come across the scent, and give tongue, so that the remainder of the pack quickly follow. They break cover, and are joined outside by the horsemen who follow the chase. The fox will, as a rule, go down wind, and make straight for some spot where he can baffle the hounds by getting under cover, or into an earth where they cannot follow him. Sometimes he throws the dogs off his scent by a subterfuge, and again he arrives at his earth only to find that it has been filled up by the 'stopper,' and he has to make off on another venture. Sometimes he is killed in the open. The kenneling and maintenance of hounds and huntsmen and the establishments kept up in the most favored neighborhoods necessitate an immense expenditure annually. The most important hunts in England are the Belvoir Castle, the Quorn, the Pytchley, and the Cottesmores. Leicestershire also is a favorite hunting county, but the sport is practically general throughout England, and in a lesser degree in Ireland. In America, the Virginian colonists early followed the English method of fox-hunting, with the difference only that the pack was made up by each gentleman bringing his own hounds with him. The sport was common in the Southern States up to the time of the Civil War, and there are still sections where it is conducted much as in the old days. In Maryland the English foxhound was crossed with the Irish staghound to give him the necessary endurance for more difficult conditions; and the records of fox-hunting in Queen Anne County go back to 1650. Dissatisfied with the gray native fox, the colonists in 1738 imported red foxes, and let them loose along the shores of the Chesapeake. They multiplied rapidly, and the Baltimore Hounds, established in 1818, have always been among the most famous in the South. The English pack has been discarded, and the Magnes strain, a distinctly Maryland dog, adopted by the Elkridge Club, the most prominent in Maryland. Pennsylvania had the first organization, the Gloucester Fox-Hunting Club, established in 1766. The American hound is faster and better than the English dog, and peculiarly well adapted for his work. In America, a 'kill' is an exception with the average hunt. 'Earths,' as the holes in the ground are called, are never 'stopped' or closed as in an English fox-hunting country, and it is very rarely that an attempt is made to dig out a fox who has taken refuge in one. Particularly is this true where the fox has made a straight, true race. Occasionally it happens that a fox becomes known, and is given a name, owing to the frequent sport he has afforded the hunt, and his exceptional skill in always making his escape. Where foxes are not found, or it is desirable to spare the cubs, drag-hunting is a very favorite sport as well as an excellent training for young horses, dogs, or riders. A course from point to point is mapped out, and a good rider, well mounted, is sent over it dragging on the ground as he goes a bag of aniseseed, or a red herring. The hounds are cast off, and pick up the scent with as much avidity and certainty as if it were that of a fox. The riders follow the hounds on horseback, and if the pace of the hounds is good, and the course suitable, a very effective and exhilarating ride is the result. The chronicles of drag-hunting go back to the reign of Charles II., further back in fact than the existence of any of the great foxhound packs today, and its practice has continued ever since. (See HORSE; HORSEMANSHIP; HUNTING.) Consult Paget, *Hunting* (London, 1900).

FOX-HUNTING, in law. As one of the national sports of Great Britain, fox-hunting is the subject not only of social usages, but of legal rules. Persons who kill foxes by traps or guns are visited with social ostracism; while those who hunt them with horses and hounds are exempted by statute from penalties for trespass within lands of others in certain cases. A master of hounds, as well as one who follows hounds in fox-hunting, is generally answerable civilly, however, for damage done to the property of others. A fox is not the subject of absolute ownership until killed or reduced into possession, and therefore not the subject of larceny. A person may acquire a qualified property, however, in tame foxes, and for injuries done by such animals he should be held liable, as for those inflicted by other *feræ naturæ* (q.v.).

Until recently the legal status of the fox in this country has been that of a noxious wild animal, liable to killing at sight by trap, gun, or dog. With the introduction of fox-breeding and fox-hunting upon large private estates has come a change in legal policy, and statutes have been enacted prohibiting the killing of foxes during certain months. Laws against cruelty to animals have been invoked to prevent the hunting of captive foxes by dogs. Consult: *Commonwealth* vs. *Turner* (145 Mass. 296, 1887); *New York Session Laws* (1901, ch. 559); Oke, *Handy Book of the Game Laws* (4th ed., London, 1897).

FOX ISLANDS. Another name for the Aleutian Islands (q.v.).

FOX RIVER. A river of Wisconsin, rising in the southern part of the State, in Green Lake County (Map: Wisconsin, E 4). It flows first in a southwesterly direction to within a few miles of the town of Portage, on the Wisconsin River, with which it is connected by a ship canal. At this point the Fox turns abruptly to the northeast, and pursues a circuitous course through the State to Lake Winnebago, through which it passes, connecting that body of water with Green Bay, an arm of Lake Michigan. It is sometimes known by the Indian name of Neenah. It is navigable for a considerable part of its course, and, through the medium of the canal connecting it with the Wisconsin, forms a link between the navigation systems of the Mississippi and the Great Lakes. The lower part of the Fox is marked by numerous rapids, furnishing great water-power. Its total length is over 250 miles.

FOX-SHARK. See THRESHER-SHARK.

FOX-SNAKE (so called from its color). An American harmless snake (*Coluber vulpinus*) inhabiting only the northern part of the Mississippi Valley. It reaches six feet or more in length, is robust, and although harmless, is easily irritated and then shows more pugnacity and courage than almost any other of its tribe. It feeds altogether upon small mammals, up to the size of a half-grown rabbit, and does farmers much service by killing great numbers of mice. Its color above is light brown, blotched on the back with chocolate, each blotch covering a space three or four scales long and bordered with black. Smaller and rounder blotches mark the sides and yellowish abdomen. It is locally known, also, as the pilot-snake, very likely by vague confusion with the copperhead. Consult Hay, *Seventeenth Annual Report, State Geologist of Indiana* (Indianapolis, 1892).

FOX-SPARROW (so called on account of its color). One of the largest and handsomest of North American sparrows (*Passerella iliaca*), distinguished by the rust-red of its plumage; purest and brightest on the rump, tail, and wings, and elsewhere on the upper parts appearing as streaks on an ashy ground; below it is white thickly marked with rust-red. It is a migrant, passing to northern Canada to breed, and favoring us on its passage in early spring with a loud and sprightly song, more like that of a thrush than a sparrow. It makes its nest on the ground, in the protection of thickets, and lays thickly spotted eggs.

FOX-SQUIRREL (so called on account of its color). The large rufous squirrel of the Mississippi Valley. See SQUIRREL.

FOXTAIL GRASS. A name applied to two very dissimilar grasses of the genera Alopecurus and Chætochloa, or Setaria, as it is better known. They bear a general resemblance to timothy, with which they are closely related. The species, which number about twenty, are natives of temperate countries of both the Northern and Southern Hemispheres, and several are American. Meadow foxtail grass (*Alopecurus pratensis*), which has an erect smooth culm about one and one-half to two and one-half feet high, and a cylindrical, obtuse, spike-like panicle abundantly covered with silvery hairs, is one of the best meadow and pasture grasses in Europe, and introduced into America. It does not arrive at full perfection till the third year after it is sown. It bears mowing well, and upon good soils yields a large crop, and is reckoned a good grass for lawns. It is very hardy, and bears drought well. The jointed foxtail, or water-foxtail (*Alopecurus geniculatus*), with an ascending culm bent at the joints, is very common in moist places, and cattle are fond of it, but it is a small grass growing but a foot or two high. The slender foxtail grass (*Alopecurus agrestis*) is an annual or biennial, of little value except for light sandy soils, on which it is sometimes sown. *Alopecurus occidentalis* is a native of the United States, and would doubtless prove valuable in the Rocky Mountain region and elsewhere. These grasses are all valuable, but should be sown in mixtures.

The other class of foxtail grass belongs to the genus Setaria. Other generic names have been given them, but these will suffice. They are mostly considered as weeds and are more or less troublesome, although when young they are eaten by stock, and the seeds of some are gathered. There are about thirty-five species, some of them exceedingly valuable. They are distributed throughout all warmer and temperate regions. The Hungarian grass or millet (*Setaria italica*), with its varieties, is extensively cultivated for its forage and seed. The latter is employed as human food in some countries, as in India, Russia, etc. The giant millet (*Setaria magna*) grows in wet places from Delaware to Florida. The common species of yellow foxtail (*Setaria glauca*), green foxtail (*Setaria viridis*), and bristly foxtail (*Setaria verticillata*), are weeds that are more or less abundant in fields and gardens of nearly all temperate countries. *Hordeum murinum* is called foxtail grass in California and elsewhere.

FOX-TERRIER. A terrier, usually white with black or tan markings, originally used for unearthing foxes, but now principally as a pet. See Terrier; Plate of Dogs.

FOY, fwä, Maximilien Sébastien (1775-1825). A distinguished French general and orator. He was born at Ham, in the Department of Somme, February 3, 1775. He was one of the volunteers of 1791, and during the next nine years served with distinction under Dumouriez, Moreau, Schoenbourg, and Masséna. In 1800 he was made adjutant-general in the Army of the Rhine, which marched through Switzerland into Italy, where he commanded the vanguard of the army in 1801. In 1805 he served under Marmont in the Austrian campaign. Two years later Napoleon sent him to Turkey at the head of 1200 artillerymen to assist Sultan Selim against the Russians and British. Under the direction of the French Ambassador, General Sébastiani, Foy defended Constantinople and the Strait of the Dardanelles, forcing Duckworth, the daring British admiral, to retire with loss. After 1808 he fought in the Peninsula, at first under Junot, and then as general of division under Soult and Masséna. He distinguished himself in the retreat into France, and was severely wounded at Orthez. In the campaign of 1815 he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819 he was elected Deputy by the Department of Aisne. In the Chamber he was the constant advocate of constitutional liberty, and showed great rhetorical talent and knowledge of political economy. He distinguished himself particularly by his eloquence in opposing the invasion of Spain in 1823. Mme. Foy published in 1827, from her husband's papers, *Histoire de la guerre de la péninsule.* In the previous year appeared his *Discours* with a biography.

FOYATIER, fwä'yȧ'tyȧ', Denis (1793-1863). A French sculptor, born at Bussière (La Grande), Loire. First instructed by Marin at Lyons, he studied afterwards under Lemot, and from 1817 at the Ecole des Beaux-Arts in Paris. For the statue of a "Faun" he was awarded the gold medal in 1819, and thenceforward executed numerous commissions for public buildings and churches in Paris and other cities. His more noteworthy works include a statue of "Saint Mark," in the Cathedral at Arras; "Wisdom" (1831), in the Chamber of Deputies, Paris; "Astydamas and Lucilia" (1833); "Faith," in Notre Dame de Lorette, Paris; "Figures of Apostles," in the Madeleine, Paris; the great "Frieze in Relief," on the Arc de l'Etoile, Paris, one of his most admired productions; and the "Equestrian Statue of Jeanne d'Arc" (1855), at Orleans.

FOYER, fwä'yȧ' (Fr., hearth). The lobby of a theatre, or large saloon in a theatre, in which the *personnel* of the theatre or the audience may promenade between the acts. It is almost always over the entrance hall. In some of the most recently erected French theatres there are two foyers, one over the other, for the accommodation of the different classes who occupy the dress circle and the upper galleries. The most magnificently decorated foyer in the world is that of the Grand Opera House in Paris.

FOYLE, foil, Lough. An inlet of the Atlantic, on the north coast of Ireland, between the counties of Londonderry and Donegal. It is 16 miles long, one mile wide at its entrance, and nine miles wide along its south side (Map: Ireland, D 1). A great part of it is dry at low water. The west side alone is navigable for vessels of 600 tons, which ascend its chief tributary, the Foyle, to Londonderry. The River Foyle, formed by the confluence of the Mourne and Finn at Lifford, flows 14 miles northeast to the lough. It has salmon fisheries.

FRAAS, fräs, Karl Nikolaus (1810-75). A German writer on agriculture. He was born at Rattelsdorf, Upper Franconia, and was educated at Munich. He was for several years professor of botany at the University of Athens, where he was also director for a time of the Royal Gardens and of the Royal School of Arboriculture. He was professor of agriculture at the University of Munich from 1847 to 1853, when he became director of the Institute of Veterinary Surgery in that city, which he thoroughly reorganized. He was chief secretary of the Bavarian Agricultural Society, and in association with Liebig conducted the agricultural experiment station organized by that society. Probably no other man of his time did so much to modernize agricultural methods in Bavaria, and his efforts in behalf of fish hatcheries were scarcely less noteworthy. His works include: *Die Schule des Landbaues* (5th ed. 1871); *Die künstliche Fischerzeugung* (2d ed. 1854); *Geschichte der Landbau- und Fortswissenschaft seit dem 16ten Jahrhundert* (1866); *Das Wurzelleben der Naturpflanzen* (2d ed. 1872).

FRAAS, Oskar (1824-97). A German geologist, born at Lorch. After holding pastorates in various parts of Germany he was successively appointed custodian of the Royal Cabinet of Natural History at Stuttgart (1854), and professor of geology (1856). Already as a student he had received a prize for a geognostic chart of Tübingen, and in 1859 he was engaged with Deffner in preparing a similar chart of Württemberg. In 1866 he made important archæological discoveries at Schussenried, Württemberg, and in 1875, on behalf of Rustem Pasha, he made the first geological survey of the Lebanon, described by him in the publications entitled *Drei Monate am Libanon* (2d ed. 1876), and *Geologische Beobachtungen am Libanon* (1878). Among his other works are: *Vor der Sündflut: Eine populäre Geschichte der Urwelt* (3d ed. 1870); *Geognostische*

Beschreibung von Württemberg, Baden und Hohenzollern (1882).

FRACASSE, ˌfrȧ′kȧs′. See CAPITAINE FRACASSE.

FRACASTORO, frä′kȧs-tō′rȯ, GIROLAMO (1483-1553). An Italian poet and physician, born of an ancient family at Verona. At the age of nineteen he was appointed professor of logic in the University of Padua. On account of his eminence in the practice of medicine, he was elected physician of the Council of Trent. His Latin verse also exhibits remarkable elegance. A bronze statue was erected in his honor by the citizens of Padua, while his native city commemorated their great compatriot by a marble statue. His writings in prose and verse are numerous. The chief among them are: *Syphilidis, sive Morbi Gallici* (1530); *De Vini Temperatura* (1534); *Homocentricorum sive de Stellis, de Causis Criticorum Dierum Libellus* (1535); *De Sympathia et Antipathia Rerum, De Contagionibus et Contagiosis Morbis, et eorum Curatione* (1546). The collected works of Fracastoro appeared for the first time in 1555.

FRACTION (Fr., OF. *fraction*, Lat. *fractio*, from *frangere*, to break; connected with Goth. *brikan*, OHG. *brehhan*, Ger. *brechen*, AS. *brecan*, Eng. *break*, and possibly with Gk. *ῥηγνύναι*, *rhēgnynai*, to break, OIr. *conboing*, breaks). A fraction is commonly defined in arithmetic as one or more of the equal parts of a unit or quantity. This definition, however, is not sufficient for expressions like $\frac{2}{-3}, \frac{3}{\sqrt{2}}$ since "2 of the — 3 equal parts of unity," or "one $\sqrt{2}$th of 3," is meaningless. Hence, in general, the symbol $\frac{a}{b}$, in which b is not zero, is regarded as denoting the division a by b.

A fraction is said to be irreducible, or to be in its lowest terms, when the greatest common divisor of its terms has been suppressed. In arithmetic, a fraction whose numerator is less than its denominator is called a proper fraction. In algebra a proper fraction is one whose numerator is of less degree than its denominator. In the contrary cases the fractions are called improper. Numerical fractions of the older form, as ¾, are called common or vulgar fractions as opposed to the more recent form of 0.75, called decimal fractions. (See DECIMAL SYSTEM.) The term was originally applied to this form as opposed to the 'astronomical' or 'physical' fractions, i.e. those on the sexagesimal system. The operations with algebraic fractions are subjected to the associative, commutative, and distributive laws (q.v.); e.g.

$$\frac{a}{b}+\left(\frac{c}{d}-\frac{e}{f}\right)=\left(\frac{a}{b}+\frac{c}{d}\right)-\frac{e}{f};$$

$$\frac{a}{b}\cdot\frac{c}{d}=\frac{c}{d}\cdot\frac{a}{b};$$

etc. Fractions of the form $\dfrac{\frac{a}{b}}{\frac{c}{d}}$ are called complex fractions, and obey the same laws as simple fractions: e.g. the complex fraction just mentioned equals

$$\frac{a}{b}\div\frac{c}{d}=\frac{a}{b}\cdot\frac{d}{c}=\frac{ad}{bc}$$

Complex fractions of the form

$$\cfrac{a}{b+\cfrac{c}{d+\cfrac{e}{f+\dotsb}}}$$

are called continued fractions. Such fractions are usually simplified to the best advantage by first multiplying the terms of the last fraction of the form

$$\cfrac{c}{d+\cfrac{e}{f}}$$

by the last denominator, and so working up. The theory of continued fractions, however, is extensive, and their properties are numerous. In the above fraction,

$$\frac{a}{b},\ \frac{ad}{bd+c},\ \frac{a\,(fd+e)}{b\,(fd+e)+fc},\ \ldots,$$

are the simplified forms of the fraction inclusive of the first, second, and third denominator successively, and so on. These are fractions evidently converging toward the true value of the given fraction. It is proved in algebra that the difference between any two consecutive convergents is equal to 1 divided by the product of their denominators; that the value of the fraction lies between each successive pair of convergents, and hence differs from either by less than their difference; e.g.

$$\frac{6935}{2151}=3+\frac{482}{2151}=3+\cfrac{1}{\cfrac{2151}{482}}=$$

$$3+\cfrac{1}{4+\cfrac{1}{2+\cfrac{1}{6+\cfrac{1}{5+\cfrac{1}{7}}}}}$$

or as it may be written,

$$\frac{3}{1}+\frac{1}{4}+\frac{1}{2}+\frac{1}{6}+\frac{1}{5}+\frac{1}{7}.$$

Here the convergents are

$$3,\ \frac{13}{4},\frac{29}{9},\frac{187}{58},\frac{964}{299},\frac{6935}{2151}.$$

The difference between the last two convergents is $\frac{1}{299\cdot2151}=0.0000016$, hence the next to the last convergent, expressed decimally, gives the value of the original fraction correct to 5 decimal places.

A fraction whose numerator is an integer and whose denominator is an integral power of 10 is called a *decimal* fraction; e.g.

$$\frac{1}{10},\frac{1}{100},\frac{3505}{10000}$$

are decimal fractions, although given in the form of common fractions. Such fractions admit of an abbreviated notation: e.g. 0.1, 0.01, .3505, which possesses great advantages in calculation. See also CIRCULATING DECIMALS.

In some algebraic fractions the substitution of a particular value of the letters will make both numerator and denominator vanish. Such fractions are called *vanishing* fractions; e.g. the fraction $\frac{x^2-1}{x-1}$ becomes $\frac{0}{0}$ when $x = 1$. The value of a fraction which assumes the form $\frac{0}{0}$ for particular values of the letters involved is, in general, found by means of the differential calculus. But frequently that value may be found by simpler means, as in the above example

$$\frac{x^2-1}{x-1} = \frac{x-1}{x-1} \cdot (x+1) = x+1,$$

the limit of which, for $x = 1$, is $1 + 1 = 2$. (See LIMITS.)

Doubtless the notion of a fraction is nearly as old as the notion of number. Among the oldest treatises on fractions is the arithmetic of Ahmes (q.v.), showing how the Egyptians dealt with fractions before the year 2000 B.C. They made extensive use of unit fractions, i.e. fractions with the numerator 1. In the hieratic writing, the denominator with a point above it was the symbol for such a fraction. The first problem Ahmes solves is that of separating a fraction into unit fractions; e.g. he finds

$$\frac{2}{9} = \frac{1}{6} + \frac{1}{18}, \ \frac{2}{95} = \frac{1}{60} + \frac{1}{380} + \frac{1}{570}.$$

The fractions of the Babylonians were sexagesimal, having at the outset a common denominator 60, and could be dealt with like whole numbers. In the written form only the numerator was given, with a special fractional sign attached. The Greeks wrote the numerator below or else before the denominator thus:

$$\overset{\kappa\alpha}{\iota\zeta}, \text{ or } \frac{}{\iota\zeta}^{\kappa\alpha'}, \text{ or } \iota\zeta'\ \kappa\alpha''\ \kappa\alpha'' = \frac{17}{21}$$

The Romans made much use of the duodecimal system, and gave special names to their fractions which corresponded to

$$\frac{1}{12}, \frac{2}{12}, \ldots \frac{11}{12}.$$

To the Hindus is due the present form of the common fraction. Although the sexagesimal and duodecimal fractions prepared the way for decimal fractions, the latter did not appear in their present form until early in the seventeenth century. Among the first to use such fractions were Rudolf, Bürgi, and Stevin. The first general use of the decimal point is found in the trigonometric tables of Pitiscus (1612).

FRACTURE (Lat. *fractura*, a break, from *frangere*, to break). In surgery, the term is used of the break of a bone or of partially ossified cartilage. A fracture is said to be *simple* where the break is not open to the air; *compound* when it is so open; *single* when there is but one break; *multiple* when more than one break exists; *comminuted* when the bone is broken into many little pieces; *impacted* when one fragment of the bone is driven into the other; *complicated* when a neighboring joint or large blood-vessel is involved in the traumatism; *complete* when the whole thickness of the bone is ruptured; *incomplete* (or green-stick) when the bone is partly broken, partly bent; *intra-capsular* when the break occurs within the capsule of a joint; and *transverse, oblique, longitudinal*, or *spiral*, according to the direction and position of the break as regards the shaft of the bone.

Among the external causes of fracture are accident or violence, and excessive muscular action. The condition known as *fragilitas ossium* occurs late in life, or in early life, as a softening of the bone from disease. Cancer, syphilis, scurvy, and rickets often result in altered bone-structure. Muscular action causes rupture of *patella* or *os calcis* (heel-bone), during the endeavor to prevent falling after tripping, or in running or jumping. The symptoms are: pain over the region; swelling and great local tenderness; change in position or shape of the part; false point of motion; crepitation (crackling, as the broken ends of the bone are rubbed together); and immobility on the part of the patient, together with increased motion secured by the examining surgeon. In impacted fractures there are necessarily no crepitation, false point of motion, or mobility secured by the surgeon. Fractures must be reduced; that is, the fragments must be put into their proper position, and they must be retained by some apparatus. The splints used for retention are made of wood, tin, iron, felt, spongiopiline, gutta-percha, leather, or of bandages saturated with plaster of Paris, with starch, or with soluble glass ('water glass,' silicate of soda solution). The limb is padded with cotton and the splint applied closely and rendered immovable. In the case of fractured ribs, a strip of adhesive plaster or a corset is applied. Rest must be secured; otherwise (or, in some cases, in spite of good attention) the fracture remains ununited; when rubbing the ends together, giving mercury internally to salivation, electricity or drilling holes in the ends, or wiring the ends together must be tried, to secure union. Compound fractures must be treated as described, and also as open wounds, under all antiseptic precautions. Drainage of pus and discharge must be secured, as well as protection against bacterial infection. See CALLUS.

FRA DIAVOLO, frä dė-ä'vȯ-lō (It., Brother Devil) (1770?-1806). A celebrated Italian brigand, born in Calabria, whose real name was Michele Pezza. He gathered a band of outlaws in the mountains of Calabria, in the country around Itri in Terra di Lavoro, and attacked alike strangers and villagers of the neighborhood. His atrocious cruelty and the fact that he had originally been a monk gained him the name of Fra Diavolo. Ferdinand of Naples summoned him to his aid against the French and made him colonel. In 1799, together with Cardinal Ruffo, he tried to stir up an insurrection in Calabria. In 1806 he repeated his attempt. He was seized by Masséna at San Severino, and was hanged at Naples as a bandit in spite of his regular colonel's commission. Auber's famous opera *Fra Diavolo*, libretto by Scribe, does not pretend to the least historical truth.

FRAGA, frä'gȧ. A town in the Province of Huesca, Spain, about 15 miles southwest of Lérida; on the River Cinca (Map: Spain, F 2). It is built on a slope and has ruined walls; among its buildings of note are the town hall, and the old parish Church of San Pedro, once a mosque. The town is in a fertile agricultural section, celebrated for its figs, which constitute the chief export. Stock-raising and some manufacturing also are carried on. Population, in 1900, 6934. Fraga, according to some authorities, is the *Gallica Flavia* of the Roman Empire. Of considerable importance under the Moors and for a time a separate emirate, it was captured by the Christians in 1149, after having been previously taken, but retaken. Fraga was specially honored in 1709 by Philip V. for its loyalty in the War of the Spanish Succession.

FRAGIACOMO, frä′jȧ-kō′mō̇, PIETRO (1856 —). An Italian marine painter. He was born at Triest, and settled at Venice. A keen observer of nature and a fine colorist, he depicts with equal mastery the sea in many of its various aspects—barks and fishermen, the distant horizon, and the sky with its ever-varying light effects. Especially noteworthy among his paintings are: "Peace" (1891); "Mournfulness" (1892), in the National Gallery, Berlin; and "San Marco," in the Vienna Museum.

FRAGMEN′TA VAT′ICA′NA (Lat., Vatican Fragments). A body of law documents in part preserved in a palimpsest, now in the Vatican library. They are thought to date from the time of Constantine.

FRAGONARD, frȧ′gō̇′när′, ALEXANDRE EVARISTE (1780-1850). A French historical painter and sculptor, born at Grasse. He was the son of Jean Honoré Fragonard, and a pupil of David, whom he always imitated. His works consist of several decorative paintings for the ceilings of the Louvre, some historical pictures, and a bas-relief for the façade of the Chamber of Deputies, taken down to be replaced by a work of the modern sculptor Cortot. His "Triumphal Entry of Joan of Arc into Orleans" is in the Orleans Museum.

FRAGONARD, JEAN HONORÉ (1732-1806). A French genre painter, born at Grasse, in Provence. He studied under Chardin and Boucher, and his manner is distinctly that of the latter master. He won the Prix de Rome in 1752, and went to Italy, where he traveled considerably, and was influenced by the Venetian Tiepolo. Upon his return to Paris he exhibited "Callirrhoë" (1765). He then executed various decorative paintings for Mme. du Barry, representing the "Loves of the Shepherds," at Louveciennes, and others for Guimard, the celebrated dancer. Afterwards he gave himself to genre subjects, some of which are suggestive of Greuze. He was also a landscape painter, an engraver, and worked in pastel and water-color. His coloring is charming, his drawing free and graceful, and, despite the often frank indelicacy of his subjects, he is more human than the classicists of David and his school. His works in the Louvre include: "Nymphs at the Bath"; "Bacchante Asleep"; "Music Lesson"; "The Guitar Player;" and "Cupid and a Girl." Other subjects are "The Happy Mother" and "The Cradle." In still another manner are "The Glass of Water," "The Tart," and "The Pot of Milk." His best known etching is "L'Armoire." His drawings include a set for the *Contes* of La Fontaine; these and others, sometimes original, sometimes after the Italian masters, are among his happiest inspirations. Consult: De Goncourt, *L'Art du XVIIIème siècle* (Paris, 1874); and Portalis, *Honoré Fragonard, sa vie et son œuvre* (Paris, 1883).

FRÄHN, frān, CHRISTIAN MARTIN JOACHIM (1782-1851). A German-Russian Orientalist and numismatist. He was born at Rostock, and was educated in that city and at Tübingen and Heidelberg. He was appointed professor of Oriental languages at the University of Kazan in 1807, and chief librarian at the Academy of Sciences, Saint Petersburg, in 1815. His principal works treat chiefly of the ethnology of the various races of Russia. They are based upon considerable research and include: *Nova Supplementa* (1855-77); *Ueber die Russen und Chazaren* (1819); *Ibn Foszlans und anderer Araber Berichte über die Russen älterer Zeit* (1823); *Die ältesten arabischen Nachrichten über die Wolga-Bulgaren* (1832); *Ein neuer Beleg dass die Gründer des russischen Staats Nordmannen waren* (1838); *Rapports concernant des collections orientales de l'Académie Impériale* (1838).

FRAIKIN, frȧ′kăɴ′, CHARLES AUGUSTE (1819 93). A Belgian sculptor, born at Herenthals, Province of Antwerp. He studied at the Academy of Brussels. Among his works are: "Venus," "Captive Love" (1848); eleven statues for the Hôtel de Ville, Brussels; the statues of the counts Egmont and Hoorn, for the great square of that city; a Madonna, "Venus Anadyomene," "The Triumph of Bacchus," and the tomb of the Queen of the Belgians at Ostend.

FRAIL, Mrs. A licentious, shrewish widow, in Congreve's *Love for Love.* She is finally married to Tattle, taking him for Valentine, while he supposes her to be Angelica. She is the sister-in-law of Foresight.

FRAKNÓI, frŏ′knō-ĭ, VILMOS (1843—). An Hungarian historian, born at Urmény. He was appointed to a professorship at Grau in 1865; was made librarian of the National Museum in 1875, and in 1879 secretary-general of the Academy, of which institution he became vice-president in 1889. His works, based upon exhaustive researches, and mostly written in the Hungarian language, include: *A Popular History of Hungary* (1873); *The Life of Archbishop John Vitéz* (1879); *The Conspiracy of Martinovitch* (1880).

FRAME (AS. *fremman, fremian,* Icel. *framja, frama,* OHG. *fremman, freman,* to advance, further, from AS. *fram, from,* Icel. *framr,* Ger. *fromm,* earnest, pious; connected with AS. *from, fram,* Goth., Icel., OHG. *fram,* from, Gk. *πέραν, peran,* Skt. *para,* beyond). A name given to the box-like covering of any kind of hotbed, flued pit, or cold pit, to protect or forward plants at seasons of inclement weather. Frames are usually made of wood, and covered with glass or cloth. The popular form is 6 × 12 feet, and several inches higher at the rear than in front. The word 'cold' used to qualify 'frame' or 'pit' implies the absence of other heat than that from the sun. See HOTBED.

FRAMING. The jointing, putting together, or building up of the skeleton or frame of any structure. The term is used particularly in speaking of steel or wooden buildings and ships. See BUILDING; SHIPS.

FRAMINGHAM, frā′mĭng-hăm. A town in Middlesex County, Mass., including the villages of Framingham Centre, South Framingham, Saxonville, and Nobscot, 21 miles west of Boston, on the Boston and Albany and the New York, New Haven and Hartford railroads (Map: Massachusetts, E 3). It is the seat of a State Normal School, and has a public library, an historical and natural history society with a valuable collection, an almshouse, a hospital, and a

Home for the Aged. South Framingham is the principal business part of the town, and has manufactures of boots and shoes, chairs, rubber and straw goods; and Saxonville has extensive woolen cloth and yarn mills. The government is administered by town meetings. Framingham was settled about 1647, was known as Danforth's Plantation until 1700, when it was incorporated under its present name (from Framingham, England). Population, in 1890, 9239; in 1900, 11,302. Consult: Barry, *History of Framingham* (Boston, 1847); Temple, *History of Framingham* (Framingham, 1887).

FRA MOREALE, mō'rȧ-ä'lȧ. See Montreal d'Albano.

FRANC, *Fr. pron.* fräNk (Fr., derived from the device, *Francorum Rex*, King of the Franks, struck by King John II. on the coin in 1360). The unit of the monetary system of France and of the States of the Latin Monetary Union—Belgium, Switzerland, Italy, and Greece. At the present time the franc is in fact the twentieth part of the twenty-franc gold piece, or 2902 grams of pure gold, equivalent in United States money to 19.3 cents. When the present monetary notation was adopted in France, in 1795, supplanting the former livre tournois, the franc was a silver coin, nine-tenths fine, weighing five grams. Such coins ceased after 1865, when the franc coin was made a token, 835 fine, without change of weight. As a silver unit it still remained in its multiple the five-franc piece, nine-tenths fine, weighing 25 grams. In 1876 the coinage of the five-franc piece was discontinued. Silver coins of 5, 2, and 1 franc, and ½ franc, are still in general use; but they are all, strictly speaking, tokens, gold having become the standard, and being represented in the coinage by pieces of 10 francs and 20 francs. The franc is theoretically divided into 100 centimes; but as the smallest coin in France is the five-centime piece, the old appellation of 20 sous to a franc (or livre) is still in frequent use. In Italy the franc is called lira, and in Greece drachma. In other countries not in treaty relations with France, the same unit prevails; in Finland, the marc; in Spain, the peseta; in Rumania, the lei; in Venezuela, the bolivar. See Latin Union.

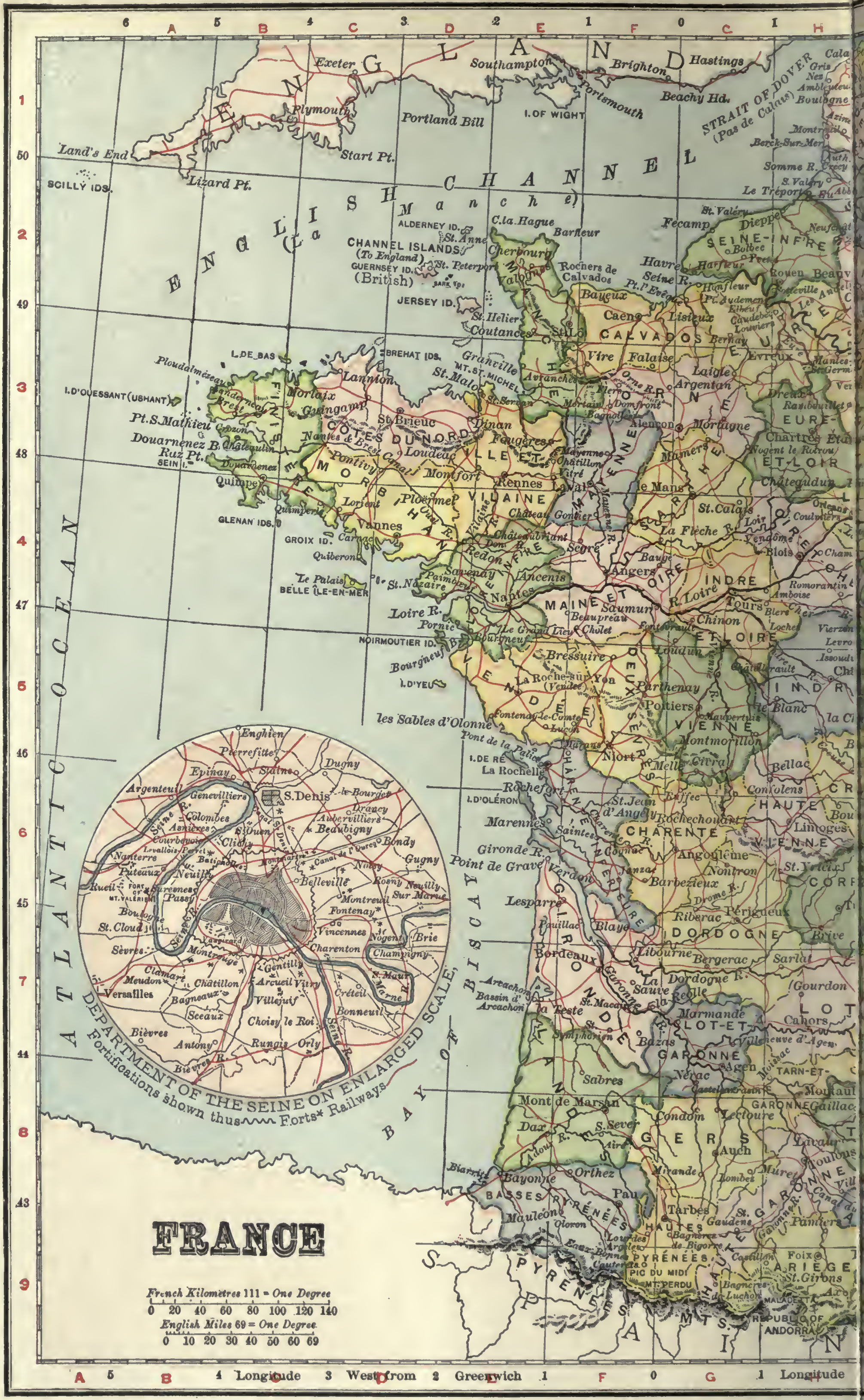
FRANC, Martin le (1410-61). A French poet, born in Normandy. He became secretary to the Duke of Savoy, afterwards Pope Felix V., and through him obtained various lucrative appointments, such as secretary to Nicholas V. Despite its accumulation of tedious detail, his long poem, *Le champion des dames* (1530), is now highly valued on account of its contemporary references and its vivid local color of the fifteenth century; and the same may be said of his prose work, *L'estrif de fortune et de vertu* (1519).

FRANÇAIS, frän'sȧ', François Louis (1814-97). A French landscape painter, born at Plombières, Vosges. He did not enter the Ecole des Beaux-Arts until 1834. While there he studied under Corot and Jean Gigoux, and exhibited first in the Salon of 1837. Many of his lithographs are remarkable, and he was also an excellent engraver on wood; but it is as a landscape painter that he stands highest. Although many of his subjects are Italian, he is particularly the painter of the banks of the Seine and the country about Paris. Français belongs to no school; he is an idealist, from the essentially poetical quality of his brush, and a realist because of his perfect sanity and the restraint and decision of his work. "The End of Winter" (1853), "Orpheus" (1863), and "Daphnis and Chloë" (1872), his masterpiece, and "Evening," are in the Luxembourg. He received first-class medals in 1848, and at the Paris expositions of 1855 and 1867, and medals of honor at the Paris Exposition of 1878 and the Salon of 1890, and the cross of the Legion of Honor in 1867.

FRANCAVILLA, frän'kȧ-vēl'lȧ. A city in South Italy, in the Province of Lecce, midway between Taranto and Brindisi (Map: Italy, K 10). It manufactures cloth, leather, and leather goods, and markets oil and wine. Population, in 1881, of commune, 16,000; in 1901, 20,422.

FRANCE. A republic of western Europe, lying between latitudes 42° 20′ and 51° 5′ N. and longitudes 4° 48′ W. and 7° 31′ E. from Greenwich (7° 8′ W. and 5° 11′ E. from Paris). It is bounded on the north by the English Channel, Strait of Dover, and North Sea; on the northeast by Belgium and Luxemburg; on the east by Germany, Switzerland, and Italy; on the south by the Mediterranean and Spain; and on the west by the Bay of Biscay, Atlantic Ocean, and the English Channel. In outline the country is roughly hexagonal, and its perimeter is about equally distributed between seacoast and frontier. The extreme length from the North Sea to the Pyrenees is about 600 miles; the greatest breadth from the extremity of Brittany to the Vosges is about 550 miles, and diagonally, to Mentone on the Mediterranean, about 675 miles. France ranks fourth in size among European countries; its area, according to official surveys, is 204,199 square miles, and, according to the determinations of the War Department, which are believed to be nearer correct, 207,107 square miles. Included in these totals are the island of Corsica and many small islands, with an aggregate surface of 3700 square miles.

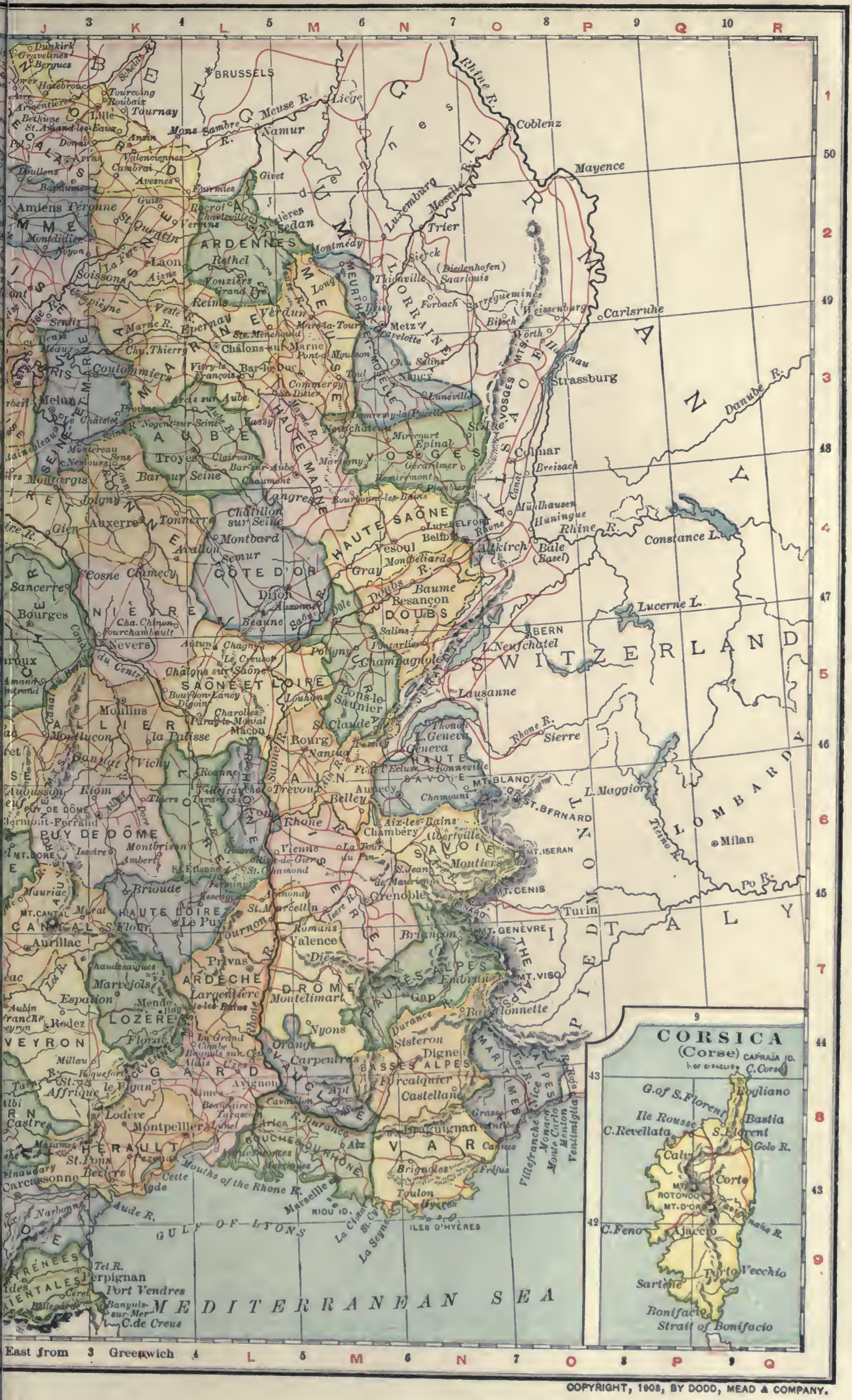
Topography. France possesses natural boundaries throughout, and is to a high degree an independent physical unit. The eastern border is girdled by the ranges of the Alps, the Jura, the Vosges, the Rhenish Highlands, and the Ardennes, which separate France from the countries of central Europe; the Spanish frontier is defined throughout its extent by the Pyrenees. The ranges on the east are broken in places by gaps and passes, through which commercial communication is maintained with the bordering States. The Pyrenees, however, present a great unbroken wall, communication with Spain being had around their extremities. On the northwest, west, and southeast the boundaries are formed by open seas, the total coast-line measuring about 1950 miles. Much of the coast-line is unbroken by important inlets, with the result that good harbors are comparatively few. Most of the harbors are river ports or are protected by breakwaters, as at Cherbourg. The northwestern coast, which confronts the southern shores of England, is intersected by the deep inlets of the Somme and the Seine, and has an irregular course, owing to the prominent peninsula of Normandy (called Cotentin), to the many capes, and to minor indentations. It varies in character from low, sandy stretches, as on the North Sea, to bold, rocky cliffs, such as are ex-



FRANCE

French Kilometres 111 = One Degree

English Miles 69 = One Degree



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posed in the Pays-de-Caux, between Dieppe and Havre, and on the north coast of Brittany. Between the latter peninsula and Normandy is the broad indentation occupied by the Gulf of Saint-Malo, with the Channel Islands, comprising Jersey, Guernsey, Alderney, Sark, etc., which are held by Great Britain, although physically belonging to the mainland. The western coast, from Pointe Saint-Mathieu, the extremity of Brittany, to the Gironde, maintains an irregular outline, and is intersected by the bays of Douarnenez, Quiberon, Bourgneuf, by the Pertuis Breton, and the Pertuis d'Antioche, and by the estuarine mouths of the Loire and the Gironde. The low and generally sandy shore is fringed by islands, of which the largest are Ouessant (Ushant), Belle Ile, Ile de Noirmoutier, Saint Martin de Ré, and Ile d'Oléron. Southward of the Gironde the coast, formed by a straight, monotonous stretch of dunes, is bordered by the arid moors of the 'Landes,' the Bassin d'Arcachon being the only important indentation in this section. The Mediterranean coast, by which France enjoys easy access to Africa and the East, stretches in a broad double curve from the Pyrenees to the Maritime Alps. Bold and rocky on the extreme west, it soon becomes low and sandy, inclosing numerous lagoons, but without good harbors. Near the middle the Rhône has built its delta seaward, and incloses between its mouths the island of Camargue. East of the Rhône the shore conforms to the projecting spurs of the Provençal Highlands, and of the Maritime Alps, which shelter the harbors of Marseilles, Toulon, Cannes, and Nice.

The physiography of France, broadly considered, falls naturally into regions that are determined, in their position and surface features, by the events of geological history. There are thus the regions of highlands on the eastern and southern borders, the great Central Plateau in the south-central part west of the Rhône Valley, the lower plateau of Normandy and Brittany, and the extensive plains in the north and west, occupied by the basins of the Seine, the Loire, and the Garonne. A line drawn diagonally across the country from Bayonne in the southwest to the Ardennes of southern Belgium in the northeast roughly divides the rolling low plains to the west of it from the central plateau and highlands to the east of it. The mean altitude of the country is about 1000 feet; but the western section averages less than 650 feet. As the chief relief is concentrated in the south and east, the land slope is toward the Atlantic; the Rhône alone, of the large rivers, takes a southerly course into the Mediterranean.

The Alps on the southeastern border are the most important highlands in the country. They extend from the Mediterranean north to Lake Geneva, a distance of 150 miles, and with the flanking chains and foothills they occupy the entire area between Italy and the Rhône Valley. The principal groups are the Maritime, the Cottian, the Graian, and the Pennine Alps; or, according to their situation in former provinces, they may be divided into the Alps of Provence, Dauphiné, and Savoy. The Maritime range on the extreme south enters France from Italy, where it has its culminating point, the highest peak across the border, French territory, being the Cime du Diable, 8816 feet. To the north the ranges increase in elevation, and the Cottian Alps are crowned by the Aiguille de Scolette, 11,500 feet above the sea. Across Mont Genèvre a pass leads from the valley of the Durance, in France, to that of the Dora Riparia, in Italy, which has been used as a highway since ancient times. West of the Cottian range is the small group of the Oisans, culminating in Les Ecrins, 13,462 feet, and north of it are the lofty Graian Alps, snow-capped and carrying glaciers on their rugged slopes, with a crest averaging nearly 10,000 feet in altitude. Near their southern end are the Pass of Mont Cenis (6850 feet), and the railway tunnel of the same name, now the principal line of communication with Italy. The Alps culminate in Mont Blanc (15,781 feet), of the Pennine range; and thence northward to the shores of Lake Geneva there is a gradual decrease in altitude. Interrupted by the valley of the Rhône, the line of highlands is continued on the north by the Jura Mountains, which are formed by several parallel groups resting upon a plateau tilted toward the west, and thus falling to the valleys of the Saône and the Doubs. The Jura Mountains follow a nearly north direction at first, but gradually bend to the east and enter Swiss territory, where, or on the frontier of France, they attain their maximum elevation of over 5600 feet (Crêt-de-la-Neige). The Vosges Mountains, separated from the Jura by the gap at Belfort, now form a part of the French frontier, their eastern slopes fronting upon Alsace, which since 1871 has been incorporated into the German Empire. Their crest is a flat-topped mountain ridge, broken by peaks of 4000 to 4700 feet elevation, connecting in the southern part with the Monts Faucilles, a low range that extends westward in the form of an arc between the sources of the Saône and the Meuse and Moselle. A northern offshoot of the latter highlands stretches along the left bank of the Meuse, and is continued by the Forest of Argonne to the low plateau of the Ardennes, of which only a small portion lies in France. The Pyrenees, rising with great abruptness on the southern border, extend from the Mediterranean to the Bay of Biscay. A height of 9100 feet is attained in Mont Canigou, near the Mediterranean, and farther west this altitude is exceeded by Montcalm (10,000 feet), Pic Long (10,475 feet), Pic du Midi (9440 feet), and by others on the French side, and by still loftier elevations south of the border. In its conformation the chain is a true sierra, having a uniform crest line that is notched by slight gaps, usually but little below the level of the neighboring peaks. Passes, practicable for railways, are found along the low coast strips at the extreme ends; but between these points there are but few highways leading from France to Spain that can be traversed without great difficulty.

The Central Plateau, south of the Loire and west of the Rhône, is the chief physiographic feature of central France. The plateau rises sharply from the Mediterranean and Rhodanian depressions in several groups of highlands that are collectively known as the Cévennes. Beginning on the southwest with the Montagne Noire, at the passage of Naurouse, between the Aude and the Garonne, which lies at the base of the Pyrenees, the elevations include in their generally northeasterly course Monts de l'Espinousse, Monts Garrigues, and the Cévennes in the lesser sense, terminating with Mont Lozère (5584 feet).

Northward the range is continued by the Monts du Vivarais, with the volcanic Mont Mézenc (5755 feet), by the mountains of Lyonnais and Beaujolais, and by a succession of highlands to the elevated region of Côte d'Or, and the plateau of Langres, between the Saône and the sources of the Seine. The Central Plateau gradually falls off in elevation to the northwest, but in Auvergne it has been broken by volcanic eruptions. The denuded cones of the extinct volcanoes are still conspicuous in numerous minor elevations near Clermont-Ferrand, and in the more massive mountains — Puy-de-Dôme (4806 feet), Mont Dore (6187 feet), and Plomb du Cantal (6096 feet). South of the volcanic region the plateau receives a special character by the Causses, sterile limestone tablelands whose surface has been dissected by erosion into deep gorges and ravines. North of this region the low mountains of the Morvan range divide the waters of the Loire and the Saône. Bordering the Central Plateau are the fertile plains of central France on the north, the plains of Périgord and Poitou on the west, and the plains of Gascony across the Garonne on the southwest.

Normandy and Brittany (ancient Armorica) are to be considered as an isolated plateau whose surface, worn down by long-continued erosion, has a general altitude of less than 1000 feet. In Brittany the plateau is broken by two lines of highlands—the Monts d'Arée and the Montagne Noire—which run out to the two promontories that inclose the Bay of Douarnenez. The Monts d'Arée on the north culminate in Saint Michel (1285 feet), the highest peak in Brittany, and the Montagne Noire in Menez Horn (1080 feet). In Normandy the elevations are grouped along no general lines; but the surface shows an alternation of low hills and open valleys. The woodland region of the Norman Bocage, in the Department of Calvados, attains an elevation of 1000 feet in a few places, and in the Forest of Ecoves, near Alençon, Mont des Avaloirs rises to a height of 1370 feet.

Corsica, a part of France since 1768, belongs physically to Italy, with which it is united by a submarine plateau. It is traversed from north to south by a mountain range, which descends on the east to a narrow coastal plain, while westward it sends out spurs that project into the sea as promontories inclosing many good harbors. The interior of the island is wild and rugged, and is dominated by peaks of considerable altitude, the highest being Monte Cinto, 8900 feet above the sea.

HYDROGRAPHY. The large drainage systems of France are those of the Rhône, the Garonne, the Loire, and the Seine; the northeastern part of the country is included in the basin of the Moselle (which flows into the Rhine) and in that of the Meuse. The Rhône, which in point of discharge is the largest of rivers, rises in Switzerland and enters France at the gap between the Alps and the Jura, flowing first southwesterly into the Rhodanian depression, where it is joined by its largest tributary, the Saône, from the north, and then sweeping to the south toward the Mediterranean. Through the Isère and Durance it drains most of the Alpine region of France, but has no important branches from the west. The basin of the Rhône covers an area of about 38,000 square miles. The Garonne, the Loire, and the Seine follow the general land slope, and drain into the Atlantic. The Garonne, with a basin of 33,000 square miles, rises on the Spanish side of the Pyrenees, and flows in its middle course along the southwestern edge of the Central Plateau, from which it receives the Tarn-Aveyron, the Lot, and the Dordogne. At its mouth it widens to form the estuary of the Gironde. The Loire, the longest of the rivers, drains the great basin of west-central France, with an area of about 46,000 square miles. It rises on the slopes of Mont Mézenc, in the Cévennes, about 30 miles from the Rhône, and thus crosses the whole breadth of the Central Plateau. The chief branches of the Loire are: On the north, the Mayenne, Sarthe, and Loir, which unite to form the Maine; and on the south, the Allier, Cher, Indre, and the Vienne-Creuse. The Seine collects the waters from the northern part of the Central Plateau, over an area of about 30,000 square miles. From the north it is joined by the Oise, Marne, and Aube, and from the south by the Yonne and Eure. Besides the four great river systems, there are several minor streams of importance, such as the Somme, Orne, Vilaine, Charente, Adour, Aude, and Hérault, the last two flowing into the Mediterranean. More than 200 rivers are officially reported as navigable, for an aggregate distance of about 6000 miles. Even the largest, however, show such fluctuations in volume between periods of floods and low water that they are not continuously navigable except by light-draught boats. The Seine is most important for commerce, being navigable for river boats beyond Paris. The utility of the natural waterways is much augmented by the extensive systems of canals that connect them; so that, for example, the canals on meeting the eastern and western rivers provide waterways across France to Belgium and Germany; the northwestern seaports of Brest and Saint Malo are joined by river and canal with the Loire; and the Gironde is extended by canal to the Mediterranean. About one-fourth of France's internal trade is carried on the waterways. There are but few lakes in France. Aside from the brackish or fresh-water lagoons along the coast, the largest are in the Alps, within the Rhône Basin. The largest of these, Lake Geneva, belongs only in part to France, the northern shore lying in Switzerland. Other well-known lakes of this region are Annecy and Bourget.

CLIMATE. The climate varies considerably between the coastal and the elevated interior regions, but it is characteristically temperate. On the Atlantic seaboard the temperatures are equalized by the warm ocean currents and southwesterly winds; toward the interior the extremes of winter and summer are more marked, and the isotherms trend steadily southward. The temperatures at Brest average for the year about 52° F., for January 43°, and for July 63°, while at Paris the yearly mean is 50°, the January average 36°, and the July average 65°. On the eastern frontier the climate has a continental character, the winters being long and severe and the summers hot. Thus, at Nancy, which is nearly in the same latitude as Paris, the annual mean is 48°, the January mean 32°, and the July mean 65°. The greatest contrast is exhibited between the bleak climate of the Central Plateau and the eastern highlands, and the warm, almost subtropical, climate of the Mediterranean coast.

The prevailing winds blow from the south and west, and from the north and northwest. The southerly and westerly winds, being warm and moisture-laden, are responsible for the most of the rainfall. A local wind, the 'mistral,' which descends from the Central Plateau upon the Mediterranean coast, is remarkable for its constancy and force. At Marseilles it blows on an average 175 days in the year, sometimes with such violence as to overturn railway trains and to denude trees of their foliage. It has a chilling effect; but by clearing the atmosphere it brings sunshine and healthfulness to the region. The rainfall, which averages about 30 inches for the whole country, is greatest along the seacoast, and in the elevated regions of the Cévennes, the Pyrenees, and the Alps, where the annual precipitation usually exceeds 40 inches. The smallest average (10 inches) is found in certain interior districts of the northern plains.

Flora. The flora of France is typical of that of Continental Europe, since plants indigenous to each region may be found in some part of the country. Except on the summits of Mounts Cantal and Dore, which were more recently formed than their neighbors, the mountain crests are tipped with species of lichens and mosses peculiar to the Arctic-Alpine regions. With lessened altitude appear species in a succession similar to their sequence in decreasing latitude—mustards, crow-foots, dwarf willows, and birches. With continued descent the trees, shrubs, and herbs characteristic of northern European forests are met with—pine, spruce, ash, beech, and oak. As the level of the sea in the south of France is approached, species indigenous to that latitude are encountered—chestnut, poplar, mulberry. The products of the northern districts and of the higher elevations are wheat, rye, oats, grapes, apples, and pears; of the middle, corn, potatoes, peaches, apricots, cherries, and strawberries; of the southwestern, grapes, prunes, figs, and various nuts; and of the Mediterranean coast, oranges, lemons, olives, and pomegranates. See Distribution of Plants; Ecology; and the paragraph on Flora in Europe.

Fauna. The fauna of France is representative of Western Europe. The wide variety of climate and physical features its extensive surface affords gives room and conditions for a great diversity of animal life. A sixth or more of its surface is covered with forests; and lofty mountains, broad, sandy plains, and a great length of coast offer suitable homes for representatives of the whole fauna of temperate Europe. Many large quadrupeds have become extinct or have been reduced to a semi-domestic condition during the centuries of human occupation. An account of the aboriginal fauna and its partial disappearance is given under Extinct Animals. Bears still survive in the Pyrenees, and wolves lurk in the forested foothills of the mountains along the Swiss and Italian borders. Wildcats are very rare, but a civet (the genet) and foxes are not uncommon, while several weasel-like carnivores occur widely. The higher mountains contain a few chamois; the moufflon remains in Corsica; and the native wild boar and fallow deer are preserved on many private estates. The porcupine is the most interesting of the many rodents as a survival near the Mediterranean of ancient forms. The birds embrace a very large list, most of which are common to all Europe. Regular routes of migration between northern latitudes and Africa traverse France, one by way of Spain and the Atlantic coast, another across the Mediterranean by way of Sardinia and Corsica, and thence into and beyond France along the valleys of the Rhône, Loire, Saône, and Meuse. Some peculiar southern birds occasionally appear, as the sand-grouse; and others are habitually present in the south of France, as the bee-eater and hoopoe. The great coast-line brings all of the wandering sea animals of the North Atlantic to French shores, which are rich in fisheries, oyster banks, and plantations, and littoral life generally. The Mediterranean gives a separate sea fauna. Among reptiles only the adder, more or less observable everywhere, need be mentioned. Cyprinoids are the most characteristic inland fishes. See Europe; Distribution of Animals; and articles upon neighboring countries.

Geology. The Central Plateau is the geological nucleus of France, around which sedimentary strata have been deposited during the Paleozoic and succeeding periods. In this region the rocks comprise granites, gneisses, and schists of Archæan character, overlaid in places by later volcanic flows of basalt and trachyte. The northern and western plains were built up during Mesozoic and Tertiary times by sedimentary accumulations along certain lines that correspond generally with the present basins of the Seine, the Loire, and the Garonne. Normandy and Brittany, however, are of more ancient (Paleozoic) formation, and resemble in geological structure the southwestern part of England, with which this portion of France was once united. The bordering highlands were uplifted at different times. The Ardennes and the Vosges consist of early Paleozoic strata, with small areas floored by Devonian and Carboniferous, the latter containing the most important coal deposits of the country. The Jura range has lent its name to the Jurassic system, which here includes thick beds of limestones and sandstones that are continued eastward into Germany. In the Alps the central granite axis is flanked by Mesozoic strata, upturned and sharply folded. The Pyrenees did not assume their present form until late Tertiary times, when there was an extensive upheaval which parted the waters of the Mediterranean and the Atlantic. Between the Central Plateau and the eastern highlands an arm of the sea once extended as far north as the Paris basin; its bed was elevated at the close of the Pliocene, and has since been occupied by the basin of the Rhône.

Mineral Resources. The coal-fields of France, while they are limited to the comparatively small area of about 2100 square miles, are the most valuable of the nation's mineral resources. The deposits are distributed over a number of small areas, including those of Nord and Pas-de-Calais (Valenciennes), which together yield 60 per cent. of the total production, and those of the Loire (Saint-Etienne), Nivernais (Le Creusot), Gard (Alais), Bourbonnais (Commentry), Tarn, and Aveyron. They furnish a good quality of bituminous coal, suitable for fuel purposes and to a less extent for iron-making. Small amounts of anthracite are mined in the Department of Isère, and about 600,000 tons of brown coal are produced annually from the deposits near Marseilles and in the Pyrenees. The output of coal in France has shown a small but steady increase during the last decade, amounting in 1900 to 33,404,298 metric tons, against 26,093,118 tons in 1890; yet the supply is insufficient to meet the home consumption, though the chief fuel used for domestic purposes is wood, and from 10,000,000 to 12,000,000 tons are imported annually. The development of manufacturing industries is retarded by lack of fuel, and especially by the high rates of transportation, which raise the price of coal up to $8 per ton or more in the districts far from the mines. These conditions have necessitated the extended use of water-power, with which the country fortunately is well supplied. The coal-mining industry employs about 160,000 laborers, and the value of the annual product is nearly $100,000,000.

Iron ore is extracted from the Jurassic rocks in the Department of Meurthe-et-Moselle and at Vassy in Champagne. Some ore is produced also in the Pyrenees and in the departments of Gard, Isère, Haute-Marne, and Saône-et-Loire. It is to the disadvantage of France's industries that her coal has to be brought to her iron, as the deposits are found together only in the districts around Le Creusot and Saint Etienne. In iron and steel manufacture France ranks about on an equality with Russia, and is surpassed by the United States, the United Kingdom, and Germany. The output of pig iron in 1900 was 2,699,494 metric tons, and of steel 1,624,048 tons, as compared with 1,962,126 tons and 581,998 tons respectively in 1890. To make this production about 2,000,000 tons of foreign ore were required in addition to the domestic supply. The chief centres of the iron and steel industry are Fives-Lille (Nord) and Le Creusot (Saône-et-Loire), the latter city rivaling Essen in Germany in its great establishments for turning out heavy ordnance and steel castings. In the production of other metals France has no special prominence. Copper is smelted near Lyons and in the Department of Pas-de-Calais, foreign ore being used almost entirely. The output in 1900 was 6466 metric tons. The production of zinc for the same year was 36,305 tons; of lead, 15,210 tons; of nickel, 1700 tons; of antimony, 1573 tons; and of silver, 85,646 kilograms. Most of the lead, zinc, antimony, and silver product was derived from domestic ores, while the nickel was imported from the French colony of New Caledonia.

In building materials and quarry products generally France is well endowed. The stone industry gives employment to more than 100,000 laborers, and the annual product is valued at about $15,000,000. Marble is quarried in the Alps and Pyrenees, granite, sandstones, and limestone in numerous localities. The French millstones, celebrated for their good quality, come from Ardèche. The value of the roofing-slates, mostly from the Ardennes, which amounted to $3,427,985 in 1900, is second only to that of the output of Great Britain. Phosphate rock, used in the manufacture of fertilizers, is quarried in the departments of Meuse and Pas-de-Calais, the product in 1900 amounting to 587,919 metric tons, valued at $2,827,291. Large quantities of this material are mined by French companies in Algeria, and shipped to France for manufacture. The output of salt in 1900 was 1,088,634 tons, this amount representing both rock and brine salt from the departments of Doubs, Jura, Basses-Pyrénées, Haute-Saône, and Meurthe-et-Moselle, and sea-salt from the Atlantic and Mediterranean coasts. Clay, gypsum, asphalt, bituminous rock, mineral paints, and lime are produced in quantities generally sufficient to meet the home consumption.

The mineral springs of France are numerous and of varied character. They are situated mostly in the mountain district of Auvergne, and in the regions bordering the Alps, Vosges, and Pyrenees. The places best known for their baths and medicinal waters are Aix, Aix-les-Bains, Enghien, Bagnères-de-Bigorre, Bagnères-de-Luchon, Barèges, Vichy, Dax, Plombières, Bourbonne-les-Bains, Bourboule, Forges-les-Eaux, and Saint-Sauveur.

Fisheries. The fishing industry is on a vast scale, giving employment to over 155,000 people. The value of its products exceeded $17,000,000 in 1888, and rose to more than $24,000,000 in 1898. Pilchards and mackerel are caught in large quantities off the coasts of Normandy and Brittany. The western coasts have extensive oyster and mussel beds; tunnies and anchovies are caught on the shores of the Mediterranean. French boats fish in the North Sea, at the Newfoundland fisheries, and off the coast of Iceland. Oyster-breeding is constantly growing in importance; in 1897 967,000,000 oysters were procured in that way as compared with but 100,000,000 in 1881. French oysters are smaller and somewhat inferior to the American product. Sardine-packing is another lucrative branch of the fishing industry, and receives Government subsidy exceeding $1,000,000 annually.

Agriculture. Its geographical position, fertile soil, and mild climate combine to make France an agricultural country. Agriculture has been the chief occupation of its inhabitants for centuries, and the French peasant and landlord have been distinguished for their quickness in adopting improved methods of cultivation following the discoveries of science; at the present day agriculture furnishes employment to more than 6,600,000 people. The most fertile sections of the country are in the north and northeast, and along the valleys of the Garonne and Rhône. The least productive are the marshy *landes* of the southwest and the mountain regions of the Pyrenees and Alps. The cultivation of cereals, wine-growing, and cattle-raising are the principal branches of agriculture. Nearly 84 per cent. of the total area of the country is productive; about 12 per cent. consists of sand, rocks, marshes, and other unproductive surface. The remaining 4 per cent. represents urban and other non-agricultural land.

Cereals. More than 57 per cent. of the land under cultivation and more than one-fourth (over 28 per cent.) of the total area of the country is devoted to the production of cereals. This area, 36,637,517 acres, is second only to that of Russia in the whole of Europe. Nearly one-half of this area is devoted annually to the production of wheat, which gives it first place in order of importance. Unlike other European countries, notably Great Britain, which have found it necessary to curtail the cultivation of wheat because of American competition, France has fairly held her own in that regard, the area under wheat at the close of the last century having declined less than 2 per cent. since 1862. The area devoted to it in 1899 was 17,141,806 acres, or about eight times that of Great Britain, the yield for the same year being 362,666,600 bushels. Wheat is largely raised in the north, in the west, in the central parts, and in the basin of the Garonne. Previous to 1860 rye bread was the staple food of the peasantry, but after that time they began to discard rye for wheat, so that the people now, though consuming much rye, are preëminently a nation of wheat-eaters. The relative importance of the various grains raised in France is shown (census of 1892) by the following table:

	Per cent. of total area under cereals	Per cent. of total value of cereals
Wheat	48.3	58.7
Oats	25.7	20.2
Rye	10.6	9.5
Barley	5.7	4.5
Buckwheat	4.1	2.3
Corn	3.6	2.8

As may be seen from the above figures, oats is next in importance to wheat, occupying more than a fourth of the total area under cereals, and yielding one-fifth of their total value. France ranks third in Europe, next to Russia and Germany, in the extent of area devoted to oats, and is second only to the former in the yield of that crop. The area under oats increased about 15 per cent. in the last forty years of the century. Rye, barley, buckwheat, and corn all declined in importance, as the following figures show:

AREA UNDER CULTIVATION

	Thousands of acres		Per cent. decline
	1862	1900	
Rye	4,764	3,509	26.0
Barley	2,686	1,871	43.6
Corn	1,450	1,337	7.8
Buckwheat	1,653	1,490	9.9

Corresponding to the decline in area there has been a decline in the production of grain. Thus the total cereal crops of France rose from 745,166,600 bushels in 1862, to 835,833,300 in 1882, declining to 759,333,300 in 1892 and 733,166,600 bushels in 1900.

FRUIT AND VINE GROWING. France is famous for her fruit, and especially for the product of her vineyards. Apples, plums, pears, peaches, and cherries abound in the north and central parts of the country, while the orange, lemon, and olive thrive in the south. Nuts also grow in great abundance. The annual crop of the French orchards and nut-bearing trees is valued at about $45,000,000, of which the various nut products constitute more than 40 per cent. The most important of these is the chestnut, the annual value of which, some $7,000,000, is the largest single item in the revenue of the French nut-growers. It grows on the poorer lands of the country, and in the mountainous regions of Auvergne and Corsica, and constitutes a staple food of the inhabitants. The vine has from a very early period constituted one of the principal sources of the agricultural wealth of France. The mild climate and the soil of the country are especially adapted to its cultivation. The choicest grapes are grown in Bordelais, Burgundy, and Champagne, but some excellent kinds are produced on the banks of the Loire and in some of the southern departments. The area devoted to this culture has diminished during the last quarter of the century. In 1901 the area was about 4,324,250 acres, as compared with 5,552,300 in 1875. The vine culture has from time to time received serious checks through attacks by the fungus known as the *oïdium*, which inflicted such serious damage that in 1854, the worst year, the acre yielded less than one-fourth of its average quantity. Another destructive disease is caused by the ravages of an insect known as *Phylloxera vastatrix*.

The damage wrought by these diseases is shown by the fact that the average yield per hectare, which steadily rose from 562.07 gallons in 1788 to 857.28 gallons in 1850, began to decline after that year until it fell to 485.48 gallons in 1892. In 1878 the French Government took the first step to combat the evil. By a series of legislative enactments calculated to encourage a war of extermination against the insect, the Government finally succeeded to such an extent that in 1900 the yield per hectare rose to 1031.38 gallons. The most effective means of overcoming the ravages of phylloxera was the importation of American vine stock upon which the French vines were grafted. The following figures illustrate the progress of the wine industry in the nineteenth century. In 1808 there were produced 742,000,000 gallons; in 1829, 820,784,500; in 1848, 1,367,983,000; in 1880, 789,832,500; in 1890, 726,524,000; in 1900, 1,784,854,500.

Stock-raising is of secondary importance in France, domestic stock being far from sufficient to meet the home demand. In 1840 the area of pasture land was 14,260,000 acres; in 1862 it increased to 19,258,980; in 1882 to 22,426,790; in 1892 to 23,358,360. In 1900 the natural or permanent pastures covered an area of 13,753,580 acres, as compared with about 14,826,000 in 1892. There were 14,521,000 cattle in 1900, as compared with 13,709,000 in 1892 and 12,997,000 in 1882. The dairy industry flourishes, especially in the north, where the products are exported to England. Horses are raised principally in the north and west. The raising of fine breeds is an object of special care on the part of the Government in the interests of the army. The number of horses has, on the whole, been stationary since 1862, the figures in 1862, 1882, and 1900 being 2,914,000, 2,838,000, and 2,903,000 respectively. Sheep-breeding is important. However, in spite of the efforts of wool-growers, the number of sheep declined from over 32,000,000 in 1842 to 29,500,000 in 1862, 23,800,000 in 1882, and 20,200,000 in 1900, a decline which had to be covered by importations. In 1900 more than 1,000,000 were imported. The number of hogs, which was on the increase until 1892, declined during the last decade of the century, being but 6,740,000 in 1900, as compared with 7,421,000 in 1892. The best breeds are raised in Champagne and the Pyrenees. Importation is necessary to meet the home demand. Goats, mules, and asses are among the animals of the French peasant. The exports of poultry, eggs, and feathers net several millions of dollars annually. Apiculture is also well developed; there were more than 1,600,000 beehives at the close of the century, yielding an annual product of honey and wax valued at more than $3,000,000.

INDUSTRIAL PLANTS. Beets owe their importance to the manufacture of beet-sugar, which originated during the early part of the nineteenth century. During the prevalence of the vine-disease, beets were employed in the manufacture of alcohol. The cultivation is carried on chiefly in the north and east; the area devoted to that plant increased from 509,520 acres in 1890 to 626,400 in 1900. The exports of beet-sugar exceeded the imports during that year by over half a million tons. Hemp and flax are grown chiefly in the north. Their cultivation is greatly on the decline, the area having decreased from 158,150 acres in 1880 to less than 44,475 in 1900; as a result, a considerable quantity of flax is imported each year. The cultivation of the mulberry-tree, introduced in the reign of Henry IV. (1589-1610), derives importance from its bearing on the production of silk. This industry receives assistance from the Government and is carried on in twenty-seven departments, the chief being Drôme, Gard, Ardèche, and Vaucluse. Nearly 150,000 persons are engaged in silk culture. For years after 1860 the production increased, though it has always fallen far short of 1850, when 25,000,000 kilograms of cocoons were raised. The average of the last decade of the nineteenth century was 8,000,000 kilograms of cocoons or 2,000,000 kilograms of raw silk. Between 1894 and 1900 the production slowly declined, the growers being discouraged by unsatisfactory profits. The production of raw silk is less than one-fifth of that of Italy. Of the other industrial plants tobacco and hops are the most important. Tobacco production, manufacture, and sale is a Government monopoly and a source of large revenue. Production is restricted to twenty-five departments, the cultivation of the plant being forbidden whenever the yield falls below a certain quantity.

LAND TENURE. France is a country of small farmers, the inheritance laws having contributed to the extreme parcellation of the agricultural land. According to the census of 1892 there were 5,702,752 farms, with a total area of 122,015,000 acres, distributed as follows:

SIZE OF FARMS	Per cent. of total number of farms	Per cent. of total area under farms
Less than 2.5 acres	39.19	2.67
From 2.5 to 25 acres	45.90	22.80
From 25 to 100 acres	12.48	28.98
More than 100 acres	2.43	45.55
Total	100	100

These figures show that while the number of small farms is very large, the ownership of the greater part of the land is concentrated in comparatively few hands. Less than 15 per cent. of all the owners possess more than 74 per cent. of all the land. The contrast is even more striking when from this category we exclude those owning comparatively small farms of from 25 to 100 acres; we then find less than 2.5 per cent. of all the owners possessing nearly one-half (45.55 per cent.) of all the land, leaving the remaining half to be divided among 97.5 per cent. of the farmers. Comparing these figures with those of the census of 1882, we find that while there was a slight falling off in the number of farms in the three highest groups, the area in the highest and lowest groups increased, while in the two intermediary groups it fell off. In other words, while the largest estates absorbed still more land, the small independent peasants were losing ground, thereby swelling the number of very small peasants whose holdings—less than 2.5 acres to a farm—are so small as to compel them to seek additional employment on the large estates. Thus France has not escaped the process of elimination of the medium-size self-sufficing farm, and is slowly tending to the English type of land distribution into large estates and small plots, the latter serving merely as a subsidiary source of income to their owners. The proportion of tenants to owners is not very large as compared with other countries, especially England, the figures being: Those cultivating their own land, 79.8 per cent.; tenants renting land for a fixed money payment, 13.8 per cent.; and tenants working for a share of the crops raised by them on the rented land, 6.4 per cent. Those of the first class, however, cultivate but 60 per cent. of the entire farm area; those of the second, 27 per cent.; and of the third, the remaining 13 per cent.

According to the character of the owners, the land is divided as follows: 2.42 per cent. belongs to the State, 0.02 per cent. to the departments, 8.79 per cent. to the communes, 0.87 per cent. to charitable and other institutions, and 87.9 per cent. to private individuals. The betterment of agricultural conditions in France is elaborately provided for by the National Department of Agriculture. This department has established under one central authority a much more comprehensive and closely coördinated system of agricultural education than is known in America. The schools are adapted to local needs. Not only is instruction in agriculture a branch of the general course in the public schools, but there are practical schools of apprenticeship especially for the training of the peasant laboring class.

FORESTS. The principal forest trees are the chestnut and beech in central France; the oak and cork tree in the Pyrenees; and the fir in the Landes. The pinaster is extensively cultivated along the southwestern coast on account of its usefulness in reclaiming the low seacoast and because of its rich yield of turpentine. The destruction of the national forests has been enormous within the last two centuries, but measures were taken as early as 1827, and especially in recent years, to plant new woods in order to protect those mountain slopes which are exposed to inundations from Alpine torrents. The forests of France at the close of the century embraced 23,749,000 acres, about one-sixth of the total area of the country. Nearly two-thirds of the area under forests is in private hands, while one-third is in the hands of the national, departmental, and communal governments.

MANUFACTURES. For centuries France held a preëminent position as a manufacturing country. She no longer holds that high rank among the industrial nations of the world. The fame of French industry was due to the skill of her craftsmen, which was developed through generations. With the advent of modern industrial appliances, the conditions for the success of which are not so much technical skill as an abundant supply of raw material, especially coal and iron, France fell at a disadvantage. Not possessing the natural resources which insure cheap power and industrial operations on a large scale, the country has been tremendously handicapped in the international contest for the world's markets. Those manufactures which are most successfully produced are largely confined to those industries or branches of industries whose products are noted for their superior artistic finish, and they do not, therefore, come into direct competition with British manufactures. The more important industries are the textile, metal, paper, chemical, glass, and pottery industries. Several other branches of manufacture redound to the fame of France by the elegance and beauty of their products, but they are of minor importance from the point of view of net financial returns. Such are the glove industry of Grenoble and Paris, the Gobelin tapestry, costly shawls, watches, clocks, articles of vertu, carriages, scientific instruments, manufactured mostly in Paris, the matchless china and glass of Sèvres, the fine furniture of Paris and Bordeaux, and many other articles of comfort and luxury. The textile industry is by far the most important, the annual output being valued at about $600,000,000. This includes woolen, cotton, silk, and linen manufactures, enumerated in the order of the value of their products. The woolen industry employs about 160,000 people in more than 2000 mills, turning out about $240,000,000 worth of goods per annum. It is carried on chiefly in the departments of Nord, Ardèche, Marne, Somme, Aisne, and Tarne. The more costly of the products of the industry, such as the Paris and Lyons shawls, the Rouen, Roubaix, and Sedan cloths, are in demand all over the world. While exporting enormous quantities of woolen goods, France has to import a good deal of raw wool, owing to the decline of the domestic output. The cotton industry, centring chiefly in the departments of Nord, Vosges, Eure, Aube, and Seine-Inférieure, employed about 150,000 persons at 5,200,000 spindles and 95,000 looms in 1900, as compared with about 100,000 persons and 4,376,000 spindles in 1890. The industry dates in France from 1773. Its annual output is valued at about $120,000,000. The silk industry, while ranking third in the value of its output, excels in the artistic finish of its products. The annual value of these is estimated at about $100,000,000. The silk-mills furnish employment to about 80,000 workers. Hand-loom weaving is rapidly declining; the chief seat of this house industry is in the Department of Rhône. In the production of linen goods France leads in the matter of style, quality, and design. The linen industry flourishes chiefly in the north, the name of Lille, Cambrai, and Valenciennes having become identified everywhere with the finest qualities of linen. No less famous are the lace manufactures of Paris, Saint-Etienne, Lyons, and Nantes.

The metal industry is next in importance. While there are large iron and steel mills in the mining region, the departments of Nord, Meurthe-et-Moselle, Loire, and Pas-de-Calais, France is far behind such countries as the United States, Great Britain, and Germany in that field, and has to resort largely to imports of machinery. It is known, however, for the fine qualities of its smaller metal ware, such as safes, hardware, steel pens, locks, files, needles, etc. The excellence of French gold and silver ware is a matter of common knowledge. The manufacture of jewelry, watches, and optical instruments deserves mention. At the opening of the twentieth century the paper industry engaged about 40,000 people in 600 paper-mills, producing some $60,000,000 worth of goods annually. In 1885 the number of mills barely exceeded 500, employing about 30,000 workmen and turning out products valued at but $23,000,000. The manufacture of glass and pottery furnishes employment to some 30,000 people, and the annual output is valued at about $25,000,000. In addition to the superb china and porcelain ware of Sèvres there should be mentioned the famous mirror-works of Saint-Gobain and Montluçon, and the imitation jewels and glass prisms. The chemical industry ranks probably next to that of Germany, the more important branches from a commercial point of view being the manufacture of perfumes, soap, and candles. Beer-brewing is increasing in importance, the consumption of beer growing at the expense of wine, especially by the poorer classes. From about 185,500,000 gallons in 1880, the annual production of beer rose to over 238,500,000 in 1900. The production of wine has kept pace with vine-growing, and French cognac still leads the world. The tobacco industry is a Government monopoly. The growth of large modern industries may best be seen from the increased use of steam-power, as shown by the following figures: In 1840 the engines and motors employed in the industrial establishments of France, not counting the railways, were capable of developing 2591 horse-power; in 1870 the horse-power exceeded 320,000; in 1890, 863,000; and in 1899, 1,865,000, showing an increase of more than 100 per cent. in the last decade of the century.

Transportation. In 1900 the railways of France had a total length of nearly 26,000 miles, Germany and Russia being the only European countries containing a greater mileage. In the same year there were 12.75 miles of line for every 100 square miles of area, which was exceeded by a number of the western European countries, but was twice as great as the corresponding figure for the United States. The railway system of France converges, with the exception of one road, upon Paris as a centre. It consists of six large divisions (not counting the State line), which constitute the great trunk lines of the country. A thorough grasp of these is essential to a clear understanding of the principal economic divisions of the country and their effect upon its industrial and commercial development. These lines are as follows, in their geographic order: the Northern, the Eastern, the Paris-Lyons-Mediterranean, the Southern, the Paris-Orleans, and the Western.

The most important is the Paris-Lyons Mediterranean Railway, running, with its numerous branches, nearly 5600 miles through the richest section of France, connecting the two largest cities of the country, Paris and Marseilles. It commands the traffic of the Rhône Valley as well as that going to and from Switzerland, Italy, and southern Germany. Its capital stock is 4,462,539,247 francs, over $892,000,000.

The Paris-Orleans Railway extends beyond Orleans to the west and south through Tours to the ports of Nantes and Bordeaux and has its southern terminal at Toulouse, where it joins the Southern Railway. It passes through a rich agricultural country, serving as an outlet for its products, which it takes to the Atlantic ports just mentioned, to the Mediterranean through the Southern Railway, and to Paris and the northern region of France. Its total length is about 4500 miles, and the capital stock 2,273,-

912,946 francs (about $455,000,000). The Southern Railway is the only trunk road that does not terminate in Paris. It traverses the south of France from east to west, joining the two roads just described. The principal terminals of the line are Bordeaux, on the Atlantic, and Cette, on the Mediterranean. At the latter point it joins the Paris-Lyons-Mediterranean line, and connects at Perpignan and Bayonne with the railways of Spain. It is the shortest trunk line in France, its length being about 2200 miles, and capital stock 1,046,016,767 francs (about $200,000,000). The Northern Railway, extending from Paris northeast to the Belgian frontier and northwest to the ports situated on the English Channel, passes through the richest mining region of France. It handles the traffic with England and Northern Europe and has terminals in the ports of Dunkirk, Calais, and Boulogne, besides passing through the important textile centres of Lille, Cambrai, Valenciennes, Arras, etc. It is about 2300 miles long, with a capital stock of 1,649,642,669 francs, or about $330,000,000.

The Eastern Railway covers the territory lying between the Northern and the Paris-Lyons-Mediterranean Railways. It is of great strategic value, since it extends directly east of Paris toward the German frontier. Though not connecting the same terminals, it competes with the two railways mentioned above, since it carries traffic to Belgium and northern Germany over Mézières, to Switzerland over Belfort, and to South Germany over Nancy. It has a length of about 2800 miles and a capital stock of 2,083,753,828 francs (about $417,000,000). Finally, the Western Railway, extending from Paris over the northwestern and western parts of France, terminates in a number of ports on the English Channel and the Atlantic, notably Dieppe, Havre, Cherbourg, Saint-Malo, and Brest. It is in a position to compete with the two adjoining roads, the Northern on the northeast, and the Paris-Orleans on the southwest. Its length exceeds 3700 miles, and its capital stock is 1,943,015,204 francs, or more than $588,000,000. The State railways cannot be said to form a trunk line, since they are not all contiguous, but form an irregular, broken net, intersecting at many points the other roads. Their length is about 1700 miles. The roads of France will thus be seen to cover each a distinct territory, distinct both in the sense that each territory is traversed by one road only and that each forms a distinct economic entity. The Northern road may be called a coal-carrying line, the Paris-Mediterranean a carrier of finished products, and the Paris-Orleans a grain-carrier.

The operation of Government and private railways side by side is the result of a long series of experiments. Since 1842, when the first law regulating the construction and operation of railways went into effect, the country has passed through a number of stages, each having its effect on the railways. The present status is the result of the law of 1883, which left the principal lines in private hands, but under strict Government control. According to the charters of the railways, their franchises expire between 1950 and 1960, when the entire railway property will pass to the State without any compensation. The Government, in 1883, turned over nearly all of the lines to private companies without any compensation. New construction is done by the Government, the companies being assessed for the purpose 25,000 francs per kilometer, a little over $8000 per mile, about one-tenth of the actual cost. For the remainder the companies advance the money to the Government, which the latter pays out in annuities at a certain rate of interest, after deducting the amounts due to it for sums advanced to the railways for the payment of dividends. The State guarantees a minimum dividend to the stockholders. In the event of inability of a road to declare the minimum dividend on the capital stock, the State advances the required sum, which, with the accrued interest, goes to make up the debt of the road to the State, payable from the profits of succeeding years. When the profits exceed a certain rate (which varies with the different roads) the Government is to receive two-thirds of the surplus. From 1883 till 1893 the deficits continued to increase, rising from 28,000,000 to 95,000,000 francs; but since 1893 they have been steadily diminishing, so that in 1899 they were only 9,000,000 francs—two roads only, the Western and the Southern, recurring to Government aid during that year, as against three in 1898 and four in 1897. The growth of railways has been as follows:

	Miles
1850	1,916
1870	11,140
1890	22,925
1900	26,370

Roads. The French highroads have world-wide fame. The laying of the first is attributed to Philip Augustus, and their more perfect organization during the sixteenth and seventeenth centuries was due to Henry IV. and Louis XIV. According to the authorities charged with their maintenance, these roads are divided into three kinds: national, departmental, and communal.

Commerce. The general commercial policy of the French Government was that of protection during the entire nineteenth century, changing from the high tariff of 1816 to the more liberal one of 1860. The unfortunate condition in which France found herself after the war of 1870-71 demanded higher tariff duties for fiscal purposes, but, owing to existing treaties with other countries, they could not be introduced before 1882, when a new general tariff was adopted raising the duties about 25 per cent. Treaties for a term of ten years terminating in 1892 were entered into with most of the European countries, of which Germany, Russia, Turkey, and Rumania enjoyed the privilege of the 'most favored nation' clause. Subsequent changes in the tariff have all been designed to make it more prohibitive. The table below shows the development of commerce during the latter half of the century:

YEAR	Imports, francs *	Exports, francs *
1860	1,897,000,000	2,277,000,000
1870	2,867,000,000	2,802,000,000
1880	5,033,000,000	3,468,000,000
1890	4,337,000,000	3,753,000,000
1900	4,698,000,000	4,109,000,000

* A franc equals 19.3 cents.

As the table shows, the tariff has crippled the import trade. As to the exports, they are on the increase, although the growth has been rather slow, owing partly to retaliatory restrictions imposed upon French commerce by other countries and partly to the industrial condition of France. The dependence of France upon foreign countries for her supply of coal and raw material is shown by the fact that these constitute nearly 65 per cent. of the total imports, while manufactured products make up only 18 per cent. As explained above under *Manufactures*, because of the different nature of the products, France does not compete with Great Britain, the United States, and Germany in the world's trade, where the demand is largely for cheap machine-made goods. As France sells a large proportion of expensive goods, and buys great quantities of cheap, bulky raw materials, vessels in the French trade often find it difficult to get full return cargoes from French ports.

The chief articles of import in the order of their importance are: wool, coal and coke, raw cotton, raw silk, oil-seeds, wool and timber, wine, cereals, etc.; the chief articles of export are textiles (silk, woolen, and cotton, the silk leading), wine, raw wool and yarn, linen, clothing, raw silk and yarn, leather and leather goods, skins and furs, metal goods and tools, chemical products, etc. Manufactured products constitute more than one-half of the total exports, while raw materials constitute about one-fourth. The principal countries to which France sends products are: The United Kingdom, nearly 30 per cent. of the total; Belgium, about 14 per cent.; Germany, 11 per cent.; Algeria, 6 per cent.; United States, 6 per cent. The United Kingdom ranks first also among the countries on which France draws for imports, about 14 per cent. of the total; next come the United States with a little less than 11 per cent., Germany with 9 per cent., Belgium with less than 9 per cent., followed by Argentina and Russia.

The course of trade between the United States and France in the last quarter of a century may be traced in the following table:

YEAR	Imports into the U. S. from France	Exports from the U. S. to France
1875	$36,708,600	$51,029,200
1891	76,688,793	60,693,190
1893	76,076,215	46,619,138
1895	61,580,509	45,149,137
1897	67,530,231	57,594,541
1899	62,146,056	60,596,899
1900	73,012,085	83,335,097

Shipping and Navigation. The French merchant marine employs more than 80,000 persons. In 1899 it consisted of 1227 steamers, of 507,120 tons capacity, and 14,262 sailing vessels of 450,636 tons, as against 1066 steamers of 492,684 tons and 14,128 sailing vessels of 440,051 tons in 1889, and 599 steamers of 277,759 tons and 14,406 sailing vessels of 641,539 tons in 1879. More than 100,000 vessels, with an aggregate capacity of 25,000,000 tons, enter the French ports annually; about four-fifths of these are French, but their tonnage barely amounts to one-half of the total. Marseilles and Havre are far in advance of other French ports both in tonnage and the value of their shipping; the other leading ports are Dunkirk, Bordeaux, Rouen, Boulogne, Saint-Nazaire, Cette, Calais, and Dieppe. A Government subsidy of $5,000,000 is granted annually to French shipping interests.

France is covered with a network of navigable canals, which afford a splendid means of inland water communication. The total length of the canals is about 1242 miles.

Weights, Measures, and Money. The metric system is the only one used throughout the country and its dependencies. There is a double standard of money, the silver being given an arbitrary value in proportion of 15½ to 1 of gold. However, there is no free and unlimited coinage of silver. By the agreement of the Latin Union, which embraces besides France the countries of Belgium, Italy, Switzerland, and Greece, the coinage of silver in each of these countries is limited. For France in 1897 the amount was 394,000,000 francs. The unit of money is the franc, equal to 19.3 cents, United States gold money. The franc has 100 centimes. The coins in use are the 10 and 20 franc gold coins; the silver coins of 1, 2, and 5 francs and of 20 and 50 centimes; and the bronze 5 and 10 centime coins.

Banking. The French banking system has in many respects served as a model for other nations. Of late years banking and financing operations generally have acquired a greater relative importance in the economic activity of the country than before, since through that channel the surplus capital of French citizens is directed into productive fields in foreign countries. With the exception perhaps of England, France holds the leading position in the world for the amount of foreign investments. There are two distinct classes of financial institutions to be considered here: (1) The Bank of France, which stands by itself; and (2) other banking institutions. The *Banque de France* is a private institution, managed under strict Government control, owing to the important Government functions intrusted to it. This control is exercised not only by general legislative provisions, such as govern all other banks, but also directly through the governors and under-governors of the bank, who are appointed by the Government. The governor can exert a veto power over the actions of the bank by refusing to sign the decisions of the General Council, which represents the stockholders. In addition to its general banking function, such as receiving and lending money and keeping accounts with private individuals, the bank conducts all the money operations of the public Treasury, and has the sole power of issuing paper money. It was founded in 1800, and passed though many changes, following the stormy events of the nineteenth century. Its present form of organization and basis of operation date from the charter of 1857, renewed in 1897, and expiring in 1920. The maximum issue of paper money is limited to 5,000,000,000 francs ($1,000,000,000). The State regulates, through the veto power of the governor, the ratio of metallic reserve to the notes in circulation. In return for the privilege of the exclusive power of note issue and of being the depository of all the public funds, the bank performs gratis all the fiscal services in connection with the keeping, transferring, and disbursing moneys on behalf of the Treasury. In addition to that it keeps open to the State at all times a credit of 180,000,000 francs ($36,000,000), free of interest or any other charges. In addition to all taxes to which other banks are subject, it pays a stamp tax on the note circulation. Its capital stock is 182,500,000 francs (or $36,500,000), and at the close of the century its principal resources and liabilities were as follows: Metallic reserve, $608,000,000 (advances for public works, about $100,000,000); loan to the State, $36,000,000 (securities and real estate, $40,000,000; note issue $800,000,000); State funds on deposit, $68,000,000; individual deposits, $105,000,000.

The other principal banking institutions are the Crédit Foncier, capital stock, $34,000,000; Crédit Lyonnais, $20,000,000; Banque de Paris et de Pays-Bas, $12,500,000; Société Générale, $12,000,000; Société Financière Lyonnaise, $10,000,000; and a number of banks with a capital of less than $10,000,000. The Paris Clearing House (*La Chambre de Compensation des Banquiers*), unlike the New York or London houses, plays an insignificant rôle. It was founded in 1872 after the London model, and although much had been expected of it, has not proved a success, owing to the reluctance of the French people to use checks. The use of checks is limited to very large transactions, and even in those cases is not always the rule. Savings banks thrive and flourish in France in great numbers. The first savings bank was established in Paris in 1818; in 1840 there were 430 such institutions, with deposits exceeding $38,000,000; at the close of the century the private savings banks numbered 547 (with 1244 branch offices), the deposits exceeding the sum of $680,000,000, credited to nearly 7,000,000 depositors. In addition to that 3,564,464 depositors had at the end of 1900 over $200,000,000 in the Government postal savings banks. The latter were founded in 1881.

FINANCES. The characteristic features of French finances are: the largest public debt of any nation in the world, both absolutely and relatively; great and rapidly growing expenditures; and heavy taxation, which nevertheless frequently leaves a large deficit, leading to fresh borrowings.

REVENUES. The revenues of the Republic are derived from two sources, taxation and State properties and monopolies. The financial system resembles more that of the United States, differing greatly from those of Great Britain and Germany in the great preponderance of indirect over direct taxes, and in the absence of an income tax. Only about one-fourth of the revenue derived from taxation comes from direct taxes, and three-fourths from indirect. In Great Britain the proportion of direct taxes to the total tax revenue is about 40 per cent., while in Prussia it is as high as 71 per cent. The revenue derived in France from all kinds of taxes constitutes about 80 per cent. of the total, the remaining one-fifth being the income from Government properties and monopolies. The more important of the direct taxes are those on real estate and buildings, taxes on property in mortmain, on royalties from mines, trade licenses, and such objects of personal use as carriages, horses, bicycles, etc. Among the indirect taxes the most important are the registration tax, contributing more than one-fourth of the total revenue from indirect taxes; customs duties, yielding more than a fifth; the tax on sugar, about one-tenth; the stamp duty, with about one-eighth of the total indirect revenue; and a large number of excise duties on various articles of consumption, such as liquors and wines, salt, candles, vinegar, the tax on railway tickets, etc. Bearing in mind that the incomes from a number of the State monopolies are practically indirect taxes, as e.g. in the case of tobacco and matches, it becomes apparent that the French consumer is heavily taxed on nearly everything he eats, drinks, wears, and enjoys; since the department and commune taxes cover nearly everything that the national Government leaves out, from doors, windows, and dogs, to every article of food that gets to the consumer from the country. The most important revenue from Government monopolies, in addition to those mentioned, are those derived from State railways, the operation of the mint, public domain, and forests.

EXPENDITURE. The chief item of expenditure is the service of the public debt, $250,000,000, which absorbs considerably more than one-third of the total revenue of the Government. The next largest item is for the War Department, over $140,000,000, or nearly one-fifth of the total; the Marine follows next, with an expenditure one-half as large; after which come the departments of Public Works, Finance, Public Instruction, Posts and Telegraphs, Colonies, etc.

The total revenue of France increased from 2,705,000,000 francs in 1875 to 3,428,000,000 in 1895, and 3,554,000,000 in 1901, the expenditures for the same years being respectively 2,980,000,000 francs, 3,510,000,000 francs, and 3,554,000,000 francs.

PUBLIC DEBT. The public debt is the natural result of continued deficits in the national budget, and dates from the fifteenth century. In 1901 it exceeded $6,000,000,000, as compared with less than $3,500,000,000 for Great Britain, $3,250,000,000 for Russia, $2,500,000,000 for Italy, $1,327,000,000 for the United States, $1,500,000,000 for Prussia. The indebtedness per capita, more than $150 in France, is far beyond that of any other country. The following table shows the growth of the French national debt and the annual interest charge it involved in the course of the nineteenth century:

YEAR	Principal, mill. of francs	Interest, mill. of francs
1800	714	36
1815	1,272	64
1830	4,426	199
1848	5,913	244
1852	5,516	239
1871	12,454	386
1889	21,251	739
1899	29,948	1,256
1901	30,097	1,243

COLONIES. Considered from an economic point of view, the French colonial system has gone through four stages since its inception in the sixteenth century. Previous to the Revolution the colonies were administered with a view to the greatest possible profit to the ruling country. In 1825 a change of policy was inaugurated tending to secure to the colonists a large measure of self-government. This condition lasted until 1841, when many of the liberties previously granted were revoked, and a stricter financial control by the Government introduced. In 1854, however, the colonists acquired considerable independence in fiscal matters. While the home Government reserves control in some matters, it makes itself responsible for the expenses involved, the most important of which are the support of the army and navy, the salaries of the various Government officials, and the maintenance of prisons. The right of the colonies to impose their own tariffs was withdrawn in 1892. That the French colonies have not proved a paying investment may be seen from the following figures: in 1900 the expenses for the colonies amounted to nearly 90,000,000 francs, Algiers and Tunis excepted. In addition the Government paid out 23,500,000 francs in ship subsidies, making a total of about 115,000,000 francs, against about 8,000,000 francs of colonial receipts. The French taxpayer is thus made to contribute more than 100,000,000 francs annually for the maintenance of French control over the dependencies.

As far as the budgets of the colonies themselves are concerned, the colonies are allowed free play in the method of raising their revenue, except the right of fixing the tariff duties; but in the matter of expenses there are certain items, called obligatory expenses, for which each colony must make provision in its budget. The obligatory expenses include, among others, the payment of the debt, the maintenance of the Government buildings, a part of the maintenance and salaries for public instruction, police, insane, and poor children. In a recent work on the French colonial system Professor Seligman thus sums up the fiscal policy of France toward her colonies: "The French Government wavers between two lines of policy. On the one hand, the movement toward local autonomy has granted the colonies substantial rights of fixing their own sources of revenue and expenditure in accordance with the dictates of local expediency. On the other hand, the movement toward centralization or so-called assimilation has taken away from the colonies the privilege of levying their own tariffs, and has imposed upon many of the dependencies a system of taxation more suitable to the interests of the mother country than to those of the colonies themselves; has declared certain of the colonial expenditures obligatory, and finally has complicated the relations between the colonies and the home Government by a series of subventions on the one hand and of contingents and contributions on the other. The most recent and enlightened colonial administrators themselves plead, not only for a simplification of the relations between the colonies and the home Government, but also for a larger share of independence and initiative on the part of the colonies themselves." As to the benefit derived by France from her colonies, the following table throws some light on the question, though it is to be noted that some of the figures which enter into the summarized item "all others" for the year 1896 were taken from earlier years:

TRADE OF FRANCE WITH ITS COLONIES. ANNUAL AVERAGE, 1887–1891.

COLONY OR PROTECTORATE	Total imports	Imports from France	Percentage from France	Total exports	Exports to France	Percentage to France
	Francs	Francs		Francs	Francs	
Tunis	42,032,000	22,863,000	54.4	35,914,000	20,386,000	56.8
Algeria, 1892–96	258,956,000	198,936,000	76.8	249,938,000	202,518,000	81.0
All others	211,043,000	73,756,000	34.9	199,350,000	98,517,000	49.4
Tunis, 1896	46,445,000	25,563,000	55.0	34,508,000	20,223,000	50.9
Algeria, 1896	275,799,000	217,802,000	79.0	240,471,000	196,842,000	81.9
All others, 1896	252,951,000	109,009,000	41.1	241,716,000	101,025,000	41.8

The development of trade shown by the table also continued into more recent years, the exports into France in 1899 amounting to 461,000,000 francs, and the exports from France to the colonies for the same year 477,000,000 francs. France controls a somewhat larger portion of the commerce of its colonies than Great Britain does of the trade within the regions which constitute a part of the Imperial domain. In general, the trade of the more recently acquired possessions is carried on to a smaller extent with France than is that of the older colonies, France having about nine-tenths of the trade with Réunion, but only one-tenth or less of the large trade of Indo-China. A considerable part of the French imports into the colonies is at the expense of the mother country, and consists of supplies for the troops, equipment material for various Government institutions and undertakings, and nearly one-fifth of the entire imports from France are made up of goods coming originally from foreign countries.

POPULATION. The following table shows the population of France in 1891 and 1901 by departments, and its density per square mile:

DEPARTMENTS	Area	Population	
	English sq. miles	1891	1901
Ain	2,239	356,907	350,416
Aisne	2,839	545,493	535,583
Allier	2,822	424,382	422,024
Alpes (Basses-)	2,685	124,285	115,021
Alpes (Hautes-)	2,158	115,522	109,510
Alpes-Maritimes	1,482	258,571	293,213
Ardèche	2,136	371,269	353,564
Ardennes	2,020	324,923	315,589
Ariège	1,890	227,491	210,527
Aube	2,317	255,548	246,163
Aude	2,438	317,372	313,531
Aveyron	3,376	400,467	382,074
Belfort (territ. de)	235	83,670	92,304
Bouches-du-Rhône	1,971	630,622	734,347
Calvados	2,132	428,945	410,178
Cantal	2,217	239,601	230,511
Charente	2,294	360,259	350,305
Charente-Inférieure	2,635	456,202	452,149
Cher	2,780	359,276	345,543
Corrèze	2,265	328,151	318,422
Corse (Corsica)	3,377	288,596	295,589
Côte-d'Or	3,383	376,866	361,626
Côtes-du-Nord	2,659	618,652	609,349
Creuse	2,150	284,660	277,831
Dordogne	3,546	478,471	452,951
Doubs	2,018	303,081	298,864
Drôme	2,518	306,419	297,321
Eure	2,300	349,471	334,781
Eure-et-Loir	2,268	284,683	275,433
Finistère	2,595	727,012	773,014
Gard	2,253	419,388	420,836
Garonne (Haute)	2,429	472,383	448,481
Gers	2,425	261,084	238,448
Gironde	3,761	793,528	821,131
Hérault	2,393	461,012	489,421
Ille-et-Vilaine	2,597	626,875	613,567
Indre	2,624	292,868	288,788
Indre-et-Loire	2,361	337,298	335,541
Isère	3,201	572,145	568,693
Jura	1,928	273,028	261,288
Landes	3,599	297,842	291,586
Loir-et-Cher	2,452	280,392	275,538

DEPARTMENT	Area	Population	
	English sq. miles	1891	1901
Loire	1,838	616,227	647,633
Loire (Haute-)	1,916	316,735	314,058
Loire-Inférieure	2,654	645,263	664,971
Loiret	2,614	377,718	366,660
Lot	2,012	253,939	226,720
Lot-et-Garonne	2,067	295,360	278,740
Lozère	1,996	135,517	128,866
Maine-et-Loire	2,749	518,589	514,658
Manche	2,289	513,815	491,372
Marne	3,159	434,734	432,882
Marne (Haute-)	2,402	243,734	226,545
Mayenne	1,996	332,387	313,103
Meurthe-et-Moselle	2,025	444,150	484,722
Meuse	2,405	292,253	283,480
Morbihan	2,625	544,470	563,468
Nièvre	2,632	343,576	323,783
Nord	2,193	1,736,341	1,866,994
Oise	2,261	401,835	407,808
Orne	2,354	354,387	326,952
Pas-de-Calais	2,551	874,364	955,391
Puy-de-Dôme	3,070	564,266	544,194
Pyrénées (Basses-)	2,943	425,033	426,347
Pyrénées (Hautes-)	1,749	225,861	215,546
Pyrénées-Orientales	1,592	210,125	212,121
Rhône	1,077	806,737	843,179
Saône (Haute-)	2,062	280,856	266,605
Saône-et-Loire	3,302	619,523	620,360
Sarthe	2,396	429,737	422,699
Savoie	2,224	263,297	254,781
Savoie (Haute-)	1,667	268,471	263,803
Seine	1,836	3,141,595	3,669,930
Seine-Inférieure	2,330	839,876	853,883
Seine-et-Marne	2,215	356,747	358,325
Seine-et-Oise	2,164	628,590	707,325
Sèvres (Deux)	2,317	354,282	342,474
Somme	2,379	546,495	537,848
Tarn	2,217	346,739	332,093
Tarn-et-Garonne	1,436	206,596	195,669
Var	2,349	288,336	326,384
Vaucluse	1,370	235,411	236,949
Vendée	2,588	442,355	441,311
Vienne	2,691	344,355	336,343
Vienne (Haute-)	2,130	372,878	381,753
Vosges	2,266	410,196	421,104
Yonne	2,868	344,688	321,062
Total	204,092	38,342,948	38,961,945

France is exceeded by many European countries in density of population, her figure of 191 people per square mile being only about one-third of those of Belgium and England, and far below those of Italy and Germany. It is, however, nearly seven times as large as that of the United States (exclusive of Alaska) in 1900. At the beginning of the nineteenth century Russia was the only European State that exceeded France in number of inhabitants. The population continued to grow rapidly until about the middle of the nineteenth century; since then the rate of growth has been remarkably low. While France in the last half of the nineteenth century gained only 2,858,127, the population of Germany gained over 21,000,000, Great Britain nearly 14,000,000. Most of the other European countries also made large gains, France falling to fifth place among European nations. This fact has given rise to serious apprehensions on the part of French statesmen, and furnished a fruitful topic of discussion to economists and publicists among all nations. The following table shows the growth of population in France during the nineteenth century.

The decline of population between the census of 1866 and of 1872 was 1,964,273, of which 1,597,228 was due to the loss of the different territories annexed to the German Empire. The remainder was due partly to losses in the war, and partly to an absolute decrease in the population in 73 departments. Between 1881 and 1886 there was a loss of population in over one-third of the departments. From 1886 to 1891 the decline of population spread over a wider area, so that the census of 1891 recorded 55 departments with a decrease in population, and only 32 with an increase. Between 1891 and 1901 there was a further decline in 62 departments, against an increase in only 25. Although the aggregate increase has been invariably greater than the loss, leaving a small gain for the country as a whole, yet the percentage of increase per decade did not hold its own during the last thirty years of the nineteenth century, and the area of declining population has been continually enlarging. The chief cause for the unsatisfactory state of the population is found in the steadily declining birth-rate. The latter is lower than in any European country, and was as follows in the last three decades of the nineteenth century: Births per 1000 living: 1871, 22.6; 1875, 26.0; 1880, 24.2; 1890, 21.8; 1900, 22.4.

France During the Nineteenth Century

YEAR OF CENSUS		Number of Population
1801	[26,930,756]	27,349,003
1821	[29,871,176]	30,461,875
1841	[33,400,864]	34,217,719
1861	[35,844,902]	37,382,225
1866	[36,495,489]	38,067,094
1872		36,102,921
1881		37,672,048
1891		38,342,948
1901		38,961,945

(The figures in brackets denote the population of that part of the country which constitutes the present territory of France.)

Of 10,845,247 families in France recorded by the census of 1896, 6,826,850, or 63 per cent., had from none to two children; in the case of 2 per cent. of the families the number of children was unknown, and 35 per cent. had three or more children. The two largest groups were those with one and two children, constituting 24.6 and 22 per cent. of the total respectively. On the other hand, the death-rate in France is among the lowest of civilized nations. In the decade of 1861-70 the annual death-rate per 1000 living persons was 23.6; in 1871-80, 23.7; 1881-85, 22.2; 1890, 22.8; 1898, 21.2. In spite of the low death-rate, there was an excess of 25,988 deaths over births in 1900. One of the chief causes of the decline of population in several departments is the concentration of population in large cities. The urban population is rapidly gaining at the expense of the rural. The change in proportion of the two was as follows in the last half of the nineteenth century:

	Population	
	Urban, per cent.	Rural, per cent.
1846	24.4	75.6
1851	25.5	74.5
1861	28.9	71.1
1872	31.1	68.9
1881	34.8	65.2
1891	37.4	62.6
1896	39.1	60.9

Thus we find the urban population increased in fifty years from one-fourth of the total to nearly 40 per cent., the rural dropping from three-fourths of the total to about three-fifths. In 1896 there were 12 cities with a population each of more than 100,000; in 1901 there were 15 such cities, the inhabitants having increased from 4,876,867 in 1896 to 5,377,486 in 1901, or 10 per cent. The following are the fifteen largest cities of France, and their population in 1851 and in 1901:

	1851	1901
Paris	1,053,262	2,714,068
Marseilles	185,082	491,161
Lyons	156,169	459,009
Bordeaux	123,935	256,638
Lille	68,463	210,696
Toulouse	85,554	149,841
Saint-Etienne	53,741	146,559
Roubaix	31,038	142,366
Nantes	91,303	132,990
Havre	26,410	130,196
Rouen	91,512	116,316
Reims	43,643	108,385
Nice	46,683	105,100
Nancy	40,289	102,559
Toulon	45,510	101,602

The movement of emigration and naturalization is too small to have any very appreciable effect upon the population of the country. The immigration exceeds the emigration, the total number of foreign-born persons in France in 1896 being 1,051,907, of whom the greater number came from Belgium and Italy. According to employment, one-fifth of the people are returned as employers, a somewhat larger proportion as workmen and clerks, less than 5 per cent. as domestic servants, and about one-half of the people as members of families dependent on those enumerated in the above groups. By occupation the people (including those depending upon the head of the family) were distributed as follows, according to the census of 1891: agriculture, 17,435,888; industry, 9,432,560; transportation, 1,199,333; commerce, 3,961,496; public employment, 1,415,235; professions, 1,114,873; private fortune, 2,169,750; unclassed, 1,304,250.

Ethnology. The perspective of history reconstructed by ethnologists is more continuous in France than in any other country. In blood the French combine many races, prehistoric Teutonic blond long-heads, Alpine or Celtic short-heads, and Mediterranean brunette long-heads. The stature of conscripts is given as 1.646 meters and the general cranial index at 83.4, ranging from 75 to 88. But anthropometric characteristics have to be studied with caution, since the tall, light-complexioned type, with blue or gray eyes, predominates in the north; the short-headed, brunette type, marked by dark eyes and low stature, prevails in the middle and south; and the Mediterranean type, brunette, dark-eyed and short, occurs in parts adjoining Italy and Spain. The southern French may be called 'Iberio-Celtic' and the northern French 'Teuto-Celtic,' the language of both being Italic. A retrospect of French ethnology includes: (1) The modern period of racial coalescence since the Crusades, embracing also nationality and speech; (2) incursions of Saracens (arrested by Charles Martel, A.D. 732), Burgundians, Franks (who gave their name to the country), and Visigoths, the last three being Teutons; (3) the Roman conquest and all that it means in racial mixtures, no less than in sovereignty and speech; (4) the earlier settlements of Belgian long-heads, Celts, or Gauls, and Aquitanian and Ligurian brunettes; (5) Semitic and Pelasgian settlements, made by Phœnician and Greek colonists, of little account, however, to the ethnologist; (6) the peoples of the earliest Iron and the Bronze Age, with a variety of skull types; (7) the Neolithic authors of menhirs and dolmens, exhibiting intermixture of brachycephals and dolichocephals; (8) the Laugerie-Chancelade or Cro-Magnon and the Neanderthal or 'Spy man,' Paleolithic dolichocephals, contemporaries of the cave bear, mammoth, and reindeer, and back of that, the rudest stone ages, when men are alleged to have lived with the mastodon and *Elephas antiquus.* France has experienced in this long stretch of time and evolution of culture the whole range of climates in which man can exist, ranging from arctic to tropical, together with their fauna and flora.

Education. Since the Franco-Prussian War the subject of education has been one of intense interest to the French people. In this respect France has probably exhibited a greater zeal than any other European country. The Republic has considered it of first importance that it should fortify itself with an enlightened citizenship. Accordingly, every grade of education has been subjected to a transformation that has been almost revolutionary. In the years 1881-82 were passed compulsory-attendance laws and laws abolishing tuition-fees. Prior to that time the educational system had been more or less dominated by clerical influence, the Catholic religion being taught, and a large number of the clergy having representation on the teaching staff. The influence of clericism was thought to be detrimental to the strengthening of republican ideals and institutions. Consequently the educational reforms assumed a religious phase, and have been more bitterly contested than in any other European country. In 1882 the teaching of religion in the schools gave way to the teaching of morals, and by a law of 1886 teaching in the public schools was limited to lay teachers, and schools in which religion was taught received no aid from the Government. The dissatisfaction on the part of some with this secularization of the schools was shown in the subsequent growth of the clerical *lycées* and colleges at the expense of the State schools of the same rank. The matter became of grave concern to the Government. In its desire to lessen the attendance at the religious schools, and thereby forestall the hostile influence which was presumably fostered by them, the Government secured the adoption of the Associations Bill, which went into effect in 1902, according to which many religious associations were obliged to dissolve their schools likewise. By a second law which made three years' preliminary study in the State school a prerequisite to securing an official State position or to enter a special school, the Government practically excluded graduates of clerical schools from admission to some of the leading professions.

The public system of education begins with the kindergarten or *écoles maternelles,* which admit children from the ages of two to six years. In addition to giving kindergarten instruction, they serve the function of infant schools where care may be given to children of the laboring classes. The establishment of these schools is optional with the communes. The attendance in 1899-1900 was: Public—chiefly lay—458,278, and private—chiefly clerical—288,839. Next are the lower primary schools, the attendance of which is compulsory for children between the ages of six and thirteen (if not receiving instruction elsewhere), or until they have passed the examination for the completion of the course, which many of them do before the end of the compulsory time requirement. The instruction, as in the higher schools, is given to the sexes separately. In 1899-1900 the attendance at the public primary schools was more than three times that of the private primary schools, and the number of children not receiving instruction was very small. The total number of children in the primary schools in 1899-1900 was 5,530,232, of whom 1,250,562 only were in the private clerical schools. The system has resulted in greatly reducing the illiteracy of the country, as is shown from the fact that in 1880 the per cent. of illiterates among conscripts was 14.4, while in 1897 it was only 5.1.

The secondary schools include State classical colleges (lycées), supported by the State, and communal colleges, supported by the communes, though aided by the State, for boys, and schools of similar rank for girls. In 1900 the lycées for boys numbered 109, and the communal colleges 229, with a total enrollment of 85,599. In the same year the non-State clerical schools of the same rank had an enrollment of 91,825, and the lay schools enrolled 10,182 pupils. The course of instruction covers five years, the most usual age of students being 13 to 18. The establishment of the communal colleges is optional with the commune. The secondary schools award the bachelor's degree. The boys' lycées were formerly classical institutions, Latin and Greek occupying the principal place in the curriculum. In 1902 an elective system was introduced, making it possible to take either a modern-language course or a science course, intended to prepare for a more practical career. Also, four distinct courses are at the option of the student, but he cannot change from one course to another, or exercise any range of choice within the course selected. All courses lead to the same degree, and confer the same privileges, and a degree may now be secured without the study of Greek and with only a minimum of Latin. History, civics, and ethics receive special emphasis, and the practical point of view is emphasized in the teaching of all subjects. The girls' lycées, however, from their introduction about 1881 took little notice of the ancient languages, but emphasized rather the French language and literature. The convents still have the patronage of a majority of those taking secondary courses, but the number who attend the newly established lycées is rapidly increasing, being 11,994 in 1899. Many of the secondary schools are attended by both boarding and day students. A large number of the more intelligent students are assisted by a system of fellowships. Graduation from the secondary schools —public or private—is a prerequisite to securing the ordinary degree from the universities.

The interests of higher education are subserved by the fifteen State universities and by various governmental and private special schools. From 1808 to 1896 the universities of France were deprived of their autonomy, and were little more than degree-conferring groups of faculties. In 1896 their autonomy was reëstablished. The fifteen universities are: Paris, Lyons, Toulouse, Poitiers, Rennes, Nancy, Montpellier, Aix-Marseilles, Bordeaux, Dijon, Lille, Grenoble, Besançon, Caen, and Clermont-Ferrand. The faculties of the universities are paid by the State, but the universities are otherwise dependent upon the local community or upon private munificence. Numerous benefactors by their liberal gifts have shown an interest in the welfare of the universities. The response of local communities must naturally vary enormously, and there is therefore a great inequality in the size and prosperity of the different institutions. Those located in large and wealthy cities, like Paris or Lyons, have a great advantage over those in smaller towns. The enrollment in the University of Paris in the year 1900 was 12,193—nearly three-sevenths of the total attendance at the State universities. The French universities attract the most students of medicine and law, the number exceeding the total taking corresponding courses in German universities. The conditions upon which degrees were formerly conferred made it difficult for a foreign student to secure them, but with the new regulation introduced in 1897 degrees are more easily obtained, and there has consequently been a very large increase in the number of foreign students.

Besides the universities there are a large number of special schools, both Government and private, covering almost every phase of science and art. The movement toward a more modern technical course of instruction has permeated the school system, having even entered the classical lycées, and in no other country do the provisions afforded for preparing for the practical affairs of life equal those of France. Special emphasis is given to instruction in commerce, agriculture, etc. Theological instruction is amply provided through schools established for that purpose. Finally, the advancement of knowledge is sought through the organization known as the Institute of France (q.v.), whose five academies embrace in their scope every phase of learning.

The administration of the educational system in France is characterized by an unusual centralization and coördination. The highest educational officer is the Minister of Education, who holds a position in the Cabinet. He is actively assisted by a Superior Council of 58 members, while a second council exercises advisory powers only. The whole State system is divided into superior, secondary, and primary departments, with a director responsible to the Minister at the head of each. For the administration of education France is divided into sixteen districts called academies, and the civil departments serve as subdivisions for each of these. At the head of each *académie* is a rector, and at the head of each department an academy inspector, the latter receiving his appointment from the Minister. Subordinate to the academy inspectors are the primary inspectors—about 450 in number. The prefect of the department, assisted by a council, appoints teachers from the approved list, submitted by the inspectors. The mayor and council of the communes are responsible for school property. The State pays all expenses for teachers, administration, and inspectors of the entire educational system; the departments pay for the erection and furnishing of normal schools, and the communes pay for the erection and furnishing of the local elementary schools. The total expenditure for public primary schools is increasing from year to year, being estimated at $6.05 per capita enrolled in public primary schools (including infant schools) in 1881-82 and at $9.20 in 1896-97. This estimate does not include the interest paid on moneys advanced for school buildings, which, if included, would raise the per capita expenditure for 1897 to $11.20.

The educational system provides particularly also for the preparation of teachers. Separate normal schools for the training of teachers for the elementary grades are provided in each civil department for men and women, at which tuition, board, rooms, and books are all free. Teaching is now a profession in France. Each normal student pledges himself to teach ten years, and all candidates for schools must hold normal certificates. Besides the elementary normal schools there are a higher normal school, intended to qualify for inspectorships and other positions of high rank, and another normal school for kindergarten teachers. The supervision of the school is in charge of the primary inspector (serving under the department inspector), who is judge of the teacher's proficiency, and upon whose recommendation depends the teacher's advancement or degradation. The schools have no position corresponding to that of superintendent or principal in the American schools. After serving the requisite time teachers are allowed to retire on a pension. The system is noteworthy in that it secures a high grade of teachers for country districts, inasmuch as the salary depends upon proficiency and is paid by the State, although the commune may supplement this from local funds, as is not infrequently done.

The French educational system seems to have failed to meet the educational needs of the country in one important respect. As compared with most of the American States, the number of pupils who continue their work into the secondary schools is small. Inasmuch as the children are yet young when they finish the primary course, there is a period in their lives when they are likely to be unoccupied, and the benefits lost of the education already acquired. France has become aroused to the need of further educational provision for the adolescent and adult periods of life, and the establishment of some form of night schools has been undertaken with remarkable success. Very little, however, has been contributed by the Government for their support, their introduction and maintenance being largely in the hands of societies and organizations. These schools are sometimes in the nature of continuation schools, but they take their form from the local needs, and sometimes follow more nearly after the style of university extension work, or of the illustrated lecture. In 1897-98 those taking courses in adult schools (popular lectures not being comprehended in these) numbered 378,000 men and 105,000 women.

Religion. All religions in France are tolerated, and since the decree of Napoleon I. in 1802 Catholic, Protestant, and Jew receive State aid, Mohammedans being similarly favored in Algeria. The amount of the State grants varies but little from year to year, the appropriation in 1902 being: for Roman Catholic worship, 40,990,-923 francs; Protestant worship, 1,495,100; and Jewish worship, 206,530. Administration and other costs amounted to 291,000 francs.

No religious census of France has been taken since 1872, and exact estimates of the numerical strength of the different religious faiths are misleading. It may be said, however, that about three-fourths of the people are, at least nominally, Roman Catholics. The indifference to the Church manifested by a large number of members, and the radical opposition to the Church and to all religions by non-members, and the resulting policy in regard to the Church, has brought upon France the charge of being an agnostic nation. The source of the opposition is generally considered to be of an historical and political nature. The relation of the Church with regard to the despised social order prevailing in pre-Revolution days is still charged against it. It is suspected of being out of harmony with republican ideals and institutions, and of being intent upon grasping power to use against the present form of government. This charge is directed particularly against the religious associations. The intimate relations of these organizations with the Vatican presumably make their interests clash with those of the Republic. During the French Revolution religious orders were disbanded and the enormous wealth they had accumulated was largely confiscated. But they have since reëstablished themselves, and have become three times as numerous as before the Revolution, there being, in 1901, 3216 establishments for men that were recognized by the Government, comprising a membership of 30,136; while there were 2870 recognized and 13,428 unrecognized establishments for women, with a total membership of 129,492. A large part of these were engaged in educational work, which was naturally one of the most potent agencies for the spread of their influence. Their wealth had likewise accumulated, and they entered extensively into various kinds of commercial enterprise, which gave them another vantage ground for the exercise of their influence. Moreover, by virtue of their standing at Rome they were supposed to have practical control over the regular clergy and the main body of the Church, whose sympathies and influence would otherwise presumably be more favorable to democracy. Opposition to the Church and the fostering of agnostic propaganda is generally supposed to centre in the Free Mason and the Socialistic elements of the population, and these factions on the one extreme and the ardent clericalists on the other are pitted against one another. In 1882 the opposition to clerical influence secured the abandonment of religious instruction in the public schools, and in 1886 the prohibition of clerical members from holding positions in them. These measures were followed in 1901 by very radical laws, directed particularly against the religious associations. According to these, all associations must be authorized by the Government, and those found to violate the law, or to be detrimental to the republican form of government, or to good morals and order, were to be dissolved. Parliamentary consent is necessary to the formation of associations which have foreign directors or a foreign domicile. It was declared that the public welfare should be considered, both in an abdication by the individual of his rights as such, and in a renunciation of the exercise of the natural faculties, such as occurs, for instance, with the taking of the vows of celibacy. It was especially intended that the law should operate against the continuance of the association schools, and it was further provided that members of dissolved

Orders could not teach until their membership with the Order was terminated.

The opposition to Catholicism has not resulted in a strengthening of Protestantism, nor, though there are occasional defections on the part of the clergy, is there any general movement within the Church to break with Rome, such as exists in Austria. The number of Protestants is actually diminishing, and it is thought to have lost considerably over one-third of its membership since 1835 (making allowance for the dismemberment of Alsace-Lorraine), the number at present being about 600,000. At the same time the influence of Protestantism under the present Government is probably out of all proportion to its numerical strength, as is evidenced by the large number of its representatives who are leading governmental officials. The Protestants are most numerous in the south of France, particularly in the Department of Gard. There are two branches of the Protestant Church, the Calvinistic and the Lutheran, the former containing the large majority of the Protestant population. The Jews are supposed to be decreasing, and number less than 100,000, the large cities, Paris, Lyons, and Bordeaux, being the chief centres. (See HUGUENOTS.)

CHARITIES. Thrift is a national characteristic of the French people, and pauperism has never been prominent in France. The policy adopted in dealing with the needy has been characterized by the emphasis which has been placed upon voluntary relief, and upon outdoor and local, as against institutional relief. The State does not recognize that the individual has a legal right to demand alms, and does not place the local communities under compulsion to provide means of charity relief. Direct parochial taxes for charitable purposes have not been levied since the time of the French Revolution. The scheme for charity administration as drawn up under Napoleon I. made possible the formation of a *bureau de bienfaisance* in each commune, but it was not made compulsory and has been impracticable in the smaller and poorer communes. There is therefore no communal machinery of relief for the poor in a large part of rural France. These bureaus (consisting of the mayor of the commune and six commissioners) solicit and receive contributions from private sources, and the bulk of their endowment is secured in this way. Special grants are sometimes made by the communes, and a tax is levied upon theatres, balls, concerts, and other amusements. The bureaus give outdoor relief, the amount of which is likely to be arbitrarily adjusted to the funds at command rather than the existing needs, and may be either meagre or excessive. Many of the communes are provided with hospitals, and sometimes a number of communes jointly use the same hospital. Coöperation between the State systems of charity and private charity is minimized, inasmuch as private charity is mainly religious, while the attitude of the State is essentially anti-religious.

There are, however, two classes of the needy that have been very adequately provided for, namely, the dangerously insane and children. The necessity for caring for the first of these is evident. Asylums for that class are established in the different departments (although there are also State asylums), and their support is divided between the departments and the communes. The State places itself under special obligation for providing for children by virtue of its law which prevents the attempt to fix the responsibility for fatherhood. Three different classes of children are distinguished in the system of child-relief. The children of the first class are under two years old—*enfants du premier âge*—and are placed in the care of a nurse under the most careful surveillance of the Government authorities, the expenses incurred being divided equally between the State and the department. The second group, or *enfants assistés,* includes foundlings, abandoned children, destitute orphans, and *enfants secourus,* not exceeding twelve years of age at the time when the Government assumes control over them, although remaining under public control until they reach the age of twenty-one. These children are usually placed in peasant homes until they are thirteen or fourteen years old, when they are made apprentices—preferably in the same family—under guardianship, the guardians being subject in turn to the oversight of the State-paid department inspectors. The other expenses incurred in providing for this group are shared between the State, the department, and the commune. A large number of children requiring public attention but not coming under either of the above classes fall in a third group, *enfants moralement abandonnés,* who are generally apprenticed or placed in an industrial school.

A departmental system of medical aid was established in 1893, and, according to the statistical returns, by the end of the century about half of the population of France availed themselves of the medical aid thus supplied. The Government further aids the masses through the establishment of savings banks, and through the State monopoly of pawnshops, and particularly, since 1897, by an annual contribution to old-age pensions. The State exercises a direction and surveillance over the administration of the charities system, this function being in charge of a department under the Minister of the Interior. The influence of the central department operates largely through the prefects, who are responsible to the Minister, and who have a voice in the appointments of boards of managers of hospitals, asylums, and *bureaux de bienfaisance.*

GOVERNMENT. The present government of the French Republic is based on a series of three so-called 'constitutional' laws, adopted by the National Assembly in 1875, and which have been amended and supplemented at different times by ordinary statutes, called 'organic' laws. The French Constitution, therefore, differs from most written constitutions in not being comprised in a single document. Another peculiarity is its brevity and conciseness. Only the barest outlines of the government—the mere framework—are provided for in the fundamental law, all the details of organization being left to the determination of ordinary statute. The numerous limitations upon the power of the Government in behalf of individual liberty, which constitute so notable a feature of the Constitution of the United States, are wholly lacking in the French Constitution. It is, in short, a constitution of government and not of liberty. That part of the Constitution which is contained in the so-called organic laws is subject to amendment by the ordinary processes of legislation, while the provisions of the constitutional laws may be changed only by action of the Chambers united in National Assembly, and by absolute majority of all the members.

The form of government which has prevailed in France since 1875 may be described briefly as a centralized parliamentary republic. The Constitution provides for a bicameral Parliament, consisting of a Chamber of Deputies and a Senate, with substantial equality of powers in legislation, the only exception being the exclusive power which belongs to the Chamber of Deputies to originate revenue measures. As to the composition of the Chamber and the source from which it proceeds, the constitutional laws contain no provisions except the single one that its members shall be chosen by universal suffrage. It was provided by ordinary statute that universal suffrage should be considered as the suffrage of all male citizens twenty-one years of age, who have resided for a period of six months previous to the election in the commune in which they offer to vote. Certain classes who have lost their civil and political rights, or who are in active military or naval service, or who have been judicially convicted of certain crimes, as well as those who have been declared bankrupt, are disqualified. It has also been determined by ordinary statute that the Chamber should consist of Deputies apportioned according to population, on the basis of one Deputy to every 70,000 inhabitants. At the present time there are 584 Deputies, distributed among 97 administrative departments, into which France and the colonies are divided. The departments are subdivided into *arrondissements*, containing approximately equal populations, and one Deputy is assigned to each. Where an arrondissement contains a population exceeding 100,000, it is divided into two or more constituencies. The Deputies are chosen, not according to general ticket (*scrutin de liste*), as Presidential electors are chosen in the United States, but by district (*scrutin d'arrondissement*), according to the American method of choosing Representatives. Both methods have been tried, chiefly with a view to obtaining party advantage; but since 1889 the single-district method has been in use, and seems likely to continue as a permanent institution. The constitutional laws make no provision concerning the qualifications of Deputies. The completion of the twenty-fifth year, however, has been prescribed by statute as a necessary qualification. To this is added a number of disqualifications, such as the holding of certain other incompatible offices at the same time. The term of service is fixed at four years, unless the Chamber is dissolved earlier, and the members are privileged from arrest during the session, unless taken in the act of committing a crime. They are, moreover, exempt from legal responsibility for opinions expressed during the discharge of their legislative duties.

The constitutional laws now in force make no provision concerning the composition and organization of the Senate, and but scant provision in reference to its powers. A statute of 1884, which superseded the constitutional law on the subject, provides that it shall consist of 300 members, chosen by electoral colleges in the various departments. In each department this body consists: (1) Of the Deputies chosen in the particular department; (2) the members of the General Council of the department; (3) the members of the councils of the several arrondissements in the department; and (4) delegates chosen by the municipal councils of all the communes of the department. The Senators are apportioned among the several departments according to population, the number in each varying from one to ten. In contrast to the method of choosing Deputies, the Senators from a given department are selected on a general ticket (*scrutin de liste*), each elector voting for the whole list. By statute the qualifications of Senators are fixed at citizenship and the completion of the fortieth year. There are also certain disqualifications similar to those in the case of Deputies. The tenure of Senators is fixed at nine years, and, to secure partial renewal, it is provided that the terms of one-third of them shall expire every three years. Originally there were 75 life Senators, chosen by the National Assembly, their successors being selected by the Senate. By an amendment to the Constitution, adopted in 1884, however, this remnant of monarchy was abolished, and it was provided that thereafter vacancies occurring among life Senators should be filled according to the manner prescribed for the choice of nine-year Senators. Senators have the same rights and privileges as Deputies, and receive the same salary, which at present is 9000 francs a year. In addition to its legislative duties, the Senate has two peculiar functions: First, its consent is necessary for a dissolution of the Chamber of Deputies—a restraint upon the possible arbitrary conduct of the President; and, second, it acts as a high court for the trial of persons accused of attempts upon the safety of the State.

The Constitution requires the two Chambers to assemble annually in January, and to remain in session at least five months. The President may convene them at an earlier date, and he is bound to do so if the demand is made by a majority of the members composing each Chamber. They may also be adjourned by the President; but the duration of the adjournment cannot exceed one month, and is not permitted to occur more than twice in a session. Bills may be presented in either Chamber by private members or Ministers, except that revenue measures must originate in the Chamber of Deputies. Whether the Senate has the right to amend bills of this character is a disputed question. The Chamber of Deputies denies the right of the Senate to increase its revenue proposals, but the Senate has asserted its right successfully on a number of occasions. All bills must be referred to a special committee for consideration before being taken up in either House. A measure duly passed by both Chambers is sent to the President for his approval. He has neither an absolute nor a qualified veto, although he may demand reconsideration of the measure, and a constitutional obligation rests upon the Chambers to consider his objections; but if they repass the measure by the regular majority it becomes law in spite of the President's objections.

Although the parliamentary system of government prevails in France and monarchical traditions are strong, the chief executive is elected, not, however, by popular vote, but by a body composed of the members of the two Chambers of the Legislature. They are required to meet for this purpose at Versailles at least one month before the legal expiration of the Presidential term, and in case of the death or resignation of the President they are commanded to assemble immediately and form themselves into an electoral college. A majority of the whole number of members is necessary to elect. The only qualification prescribed by the Constitution is that the President shall not be a member of any family that has reigned in France. His term is fixed at seven years, and it is expressly declared that he is reëligible. The President's position is one of irresponsibility except for the offense of high treason, and even then he is subject to arraignment by the Chamber of Deputies only, and to trial by the Senate only.

The powers and duties of the President are manifold. In the domain of foreign relations his powers include the negotiation of treaties, with the limitation, however, that treaties of peace and of commerce, treaties which add to the financial burdens of the State or which subtract from its territory, or which affect the personal or property relations of Frenchmen in foreign countries, must be approved by the Chambers; the appointment and reception of ambassadors and ministers; and perhaps the power to wage defensive war and, with the assent of the Chambers, to wage offensive war. Besides the powers of the President in legislation, to which reference has already been made, he may prorogue the Parliament, may initiate legislative measures, and it is his duty to promulgate the laws. In the field of administration he has a wide power of appointment and of supervision, and an extensive ordinance power. The Constitution expressly confers upon him the appointment of all officers, and by implication the dismissal of most of them. He has the power of issuing the necessary ordinances for the execution of the laws where the Legislature has not made provision for the same. He has also the power in many cases to issue supplementary ordinances for the purpose of filling out the details of legislative acts, for it must be remembered that it is the practice in France to embody only the main facts in the statutes, leaving minor details to be supplied by executive ordinance. The military powers of the President include the disposition of the army and navy, while in the domain of judicial administration he is vested with the power to grant pardons, commute penalties, and issue reprieves.

In exercising the above-mentioned powers the President acts through Ministers who are collectively responsible to the Chambers for the general policy of the administration, and individually responsible for their own personal acts. The Constitution expressly declares that every official act of the President to be valid must be countersigned by a Minister, thus insuring the irresponsibility of the President. Theoretically, at least, he is in the position of the British sovereign, and can do no wrong. In theory the Ministers are appointed by the President and serve during his pleasure. In practice they are appointed by the leader of the majority in the Chamber of Deputies, and they resign when defeated. Legally their responsibility is to both Chambers, but as a matter of fact it is only to the Chamber of Deputies, and an adverse vote in the Senate no longer leads to the resignation of the Ministry. Usually the Ministers are selected from the members of Parliament, but whether they are or not, they are entitled to seats in the Chambers, and must be heard whenever they wish to speak. Their duties are of a twofold character. In the first place, they are the heads of the several administrative departments of the Government, and secondly they are the leaders of the parliamentary majority in the Legislature and the representatives of the Government whose measures they seek to have adopted, and whose general policy they defend against attack. The number of Ministries or departments is fixed by decree of the President, and varies from time to time. At present there are eleven: those of the Interior; of Justice; of Foreign Affairs; of War; of Marine; of Public Instruction; of Public Works; of the Colonies; of Commerce; of Agriculture; and of Finance. Besides acting as heads of the departments they are also members of the Council of State, the highest administrative court in the Republic. Their responsibility is both political and criminal. Their political responsibility is collective in matters of general policy, and single in cases of individual activity, and is secured by liability to dismissal from office. Their responsibility for crimes committed in the exercise of their duties is to the Legislature, the Chamber of Deputies acting as the accuser and the Senate as the trial court. For crimes committed in their private capacity they are responsible to the ordinary judicial courts. The Ministers are held to their political responsibility through several forms of interrogation in the Chambers. These are the 'direct question,' which any member may ask of a Minister after previously securing his consent, the purpose being to gain information concerning the policy of the Government; and the 'interpellation,' which is a formal challenge of the Government's policy, and is usually followed by a vote of confidence or of disapproval. Unlike the direct question, the interpellation is always in order, and the consent of the Minister questioned or of the Cabinet is not necessary.

Finally, it should be said that French Ministries are short-lived, chiefly on account of the numerous party divisions and factional groups in France. As yet no Ministry of the Republic has continued in power for a period exceeding three years.

The judicial system of France is a purely statutory creation, the only constitutional provision on the subject being that which relates to the constitution of the Senate as an extraordinary court for certain cases. By statute a hierarchical system of judicial and administrative courts has been created. Of the judicial courts, the highest is the Court of Cassation at Paris, which is composed of a First President, three presidents of sections, and forty-five judges or councilors. Next below this tribunal are the twenty-six Courts of Appeal, each composed of a president and four councilors, and with territorial jurisdiction over several departments. They hear cases from the Courts of First Instance in the arrondissements, while these in turn hear appeals from decisions of the justices of the peace in the cantons. These latter try civil cases and act as police judges for the disposal of petty offenses. For the trial of criminal cases involving penalties up to imprisonment for five years, police correctional courts without juries are provided. More serious crimes are tried by courts of assizes, constituted periodically in each department, and consisting of a jury of twelve men who are the sole judges of the question of guilt, and who fix the punishment. The ordinary civil courts are without juries, the judges alone deciding the question of fact, as well as of law. The judges are appointed by the President of the Republic, and their tenure, except in the case of the justices of the peace, is good behavior. They can be removed only by the Court of Cassation.

The administrative courts are an outgrowth of the Napoleonic legislation, and are intended to relieve the judicial courts from the decision of administrative questions. It is the French theory that such questions should be determined by men who have a practical knowledge of administrative law, rather than by judges who have been trained only in the private law. The administrative courts are tribunals of enumerated jurisdiction, but the general rule is that they take cognizance of all administrative acts. The judges of the administrative courts are all appointed by the President, but, unlike the members of the judicial courts, are removable at his pleasure. They are trained in the work of administration and receive large salaries. The most important administrative court in France, as well as the highest, is the Council of State. It is composed of 116 members (councilors, commissioners, and auditors), and is divided into four administrative sections and one judicial section. It has both original and appellate jurisdiction in a variety of administrative matters. Next to the Council of State in importance are the prefectural councils of the departments. There is one in each department, and it is composed of several councilors, together with the prefect. It has a large contentious jurisdiction in administrative matters, and appeals from its decisions lie to the Council of State. Besides these courts there are a number of special administrative tribunals of minor importance. To determine whether the administrative or the judicial courts shall have jurisdiction in a given case, where the question of the forum is in dispute, a Tribunal of Conflicts is provided. It belongs to the prefect to raise the question of competence, whereupon the matter is sent to the Conflict Court for determination.

Local government in France differs from the English and American systems in several important respects. In the first place, the organs of local government in France are not generally authorities of enumerated powers, but are vested with the management and control of all local affairs without any attempt at specification. Secondly, to prevent the local organs from misusing such wide powers, the method of central administrative control has been introduced. This is the most important characteristic of French local government, and, like the system of administrative courts, was inherited from the Napoleonic era. While it secures uniformity and symmetry, it destroys the element of local self-government. The activities of the local organs are twofold. In the first place, they are made use of by the central Government for the administration of matters of central concern. In the second place, they attend to matters of purely local interest largely according to their own ideas and through officers of their own choosing. For the purposes of administration France is divided into eighty-seven departments, in each of which is a prefect, appointed and removed at the pleasure of the President. He is both a central and a local officer. As agent of the central Government he supervises the execution of the national laws, and decrees and instructions of the Ministers, particularly those of the Minister of the Interior, of whom he is a subordinate; issues police ordinances, appoints many officials and directs them in their duties, and makes reports to the Government on matters in which it is concerned. In this capacity he is assisted by a prefectural council, appointed and dismissed by the President—a body whose advice he is often bound to ask, but never obliged to follow. As a local officer he appoints all the officials in the service of the department, has charge of departmental finances and public improvements, and executes the resolutions of the General Council. This latter body is the legislative assembly of the department, and is chosen by universal suffrage for a term of six years, one-half the members retiring every third year. It holds regular sessions twice a year, and the subjects to which its legislative power extends include departmental property, finances, highways, public works, and poor relief. Its resolutions in many cases may be annulled by the central Government, and in some cases they must be approved by the President of the Republic to be valid. If, for example, in the preparation of the budget, the council should neglect or refuse to make the necessary appropriations, or levy the taxes required, the President is empowered to order it done.

The next local subdivision below the department is the arrondissement. This is an administrative and election district rather than a public corporation for purposes of local government. Below the arrondissement is the canton—an election and judicial district of little importance. The lowest administrative unit is the commune—a local area of historical growth rather than an artificial creation. It may be either urban or rural, and varies in size from a few acres to several square miles. The two communal organs which correspond to the prefect and the general council of the department are the mayor and the municipal council. The mayor, like the prefect, is both a central and a local officer, and since 1884 has been elected by the municipal council. As a central officer, he is subject to the control and direction of the prefect. He serves during the term of the council by which he is elected, but may be suspended temporarily by the prefect or Minister of the Interior, and removed by the President. As central officer he keeps a register of vital statistics, solemnizes marriages, has charge of the police, and issues ordinances affecting the public health, order, and safety. As local officer he appoints most of the communal officers, administers the local property, draws up the budget, and supervises the execution of the resolutions of the municipal council. The municipal council is the deliberative organ of the commune, and is elected by universal suffrage for a term of four years. It holds four regular sessions annually, may be suspended temporarily by the prefect, and dissolved by the

President of the Republic. Its duties extend chiefly to purely local affairs, but the approval of the central Administration is necessary for the validity of its resolutions on many subjects, such as those relating to the erection of public works, incurring loans, levying taxes, and appropriating money. Any act deemed by the central Administration to be in excess of its jurisdiction may be declared void. Excepted from this general system of municipal government are the capital, Paris, and the city of Lyons, for the government of which a special arrangement is provided.

National Defense. In view of the great emphasis placed upon keeping the national system of defense in the highest possible degree of efficiency, and the important rôle which the army plays in the national life, France has become known as a military republic. All able-bodied men are liable to military service for a term of 25 years. Three years' active service, beginning at the age of 20 years (although the individual may volunteer his services during the two preceding years), are required; but provisions are made, applying mainly to advanced students, by which under qualified conditions the period may be shortened to one year. Appointments to military offices are made by the President of the Republic, but the command of the army is vested in the department of the Ministry of War. In 1902 the total strength of the army, including the forces in Algeria and Tunis, was 589,444. There are 4,350,000 men who are liable to military duty, of whom 2,500,000 are available. A statement of other general regulations, and the treatment of the scheme and the statistics of army organization will be found under the title Army. Staff officers are trained at a military school in Paris, the course being two years, and admission is secured by competitive examinations; infantry and cavalry officers are trained at Saint-Cyr; artillery and engineer officers at the polytechnic school situated at Fontainebleau; and in addition to these there are a large number of schools for various phases of military instruction.

The fortifications of France, being situated naturally with reference to the nature of the frontier and the relative danger of invasion, are most numerous in the north. Lille and Maubeuge are on the Belgian frontier; Toul, Verdun, Epinal, and Belfort are near the German frontier. Other fortified places in the north are Laon, La Fère, Paris, and Langres. The fortifications at Besançon, Pontarlier, Dijon, Albertville, Briançon, Nice, Grenoble, and Lyons defend the country on the east. Near the Spanish frontier are the small fortifications of Perpignan and Mont Louis, on the east, and Bayonne, on the west. The Atlantic Coast fortifications are Dunkirk, Calais, Boulogne, Havre, Cherbourg, Granville, Saint-Malo, Brest, Lorient, Saint-Martin de Ré, Ile d'Aix, Oléron, La Rochelle, Rochefort, and the Estuary of the Gironde; while the Mediterranean coast is protected at Villefranche, Antibes, Saint-Tropez, Marseilles, Toulon, Cette, and Port-Vendres.

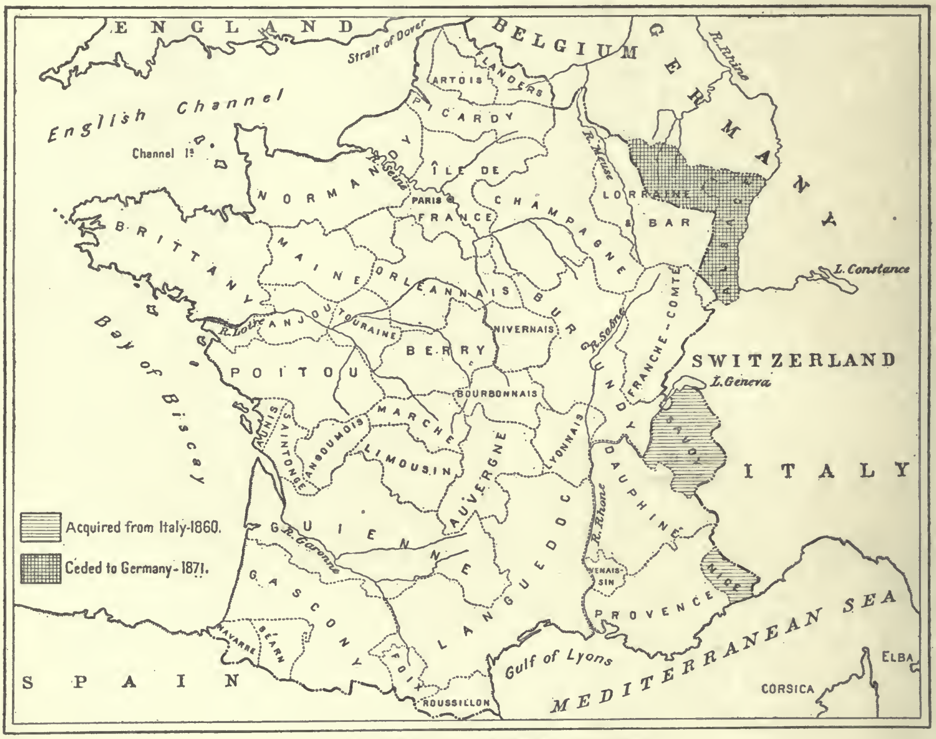
Great attention is also given to the naval branch of the national defense, and the navy of France is generally considered to rank next to that of Great Britain. The personnel of the navy is recruited partly by voluntary enlistment, and partly by conscription. The Government maintains a list of all of the men between the ages of eighteen and fifty years who are engaged in a seafaring life, and these men constitute a naval reserve. Particulars of the organization and strength of the navy are given in the article Navy. The colonial points used by France as a basis of supplies and operation are: Cape Saint Jacques in Cochin-China, Port Courbet in Tongking, Fort de France in Martinique, Saintes in Guadeloupe, Port Phaéton in Tahiti, Nouméa in New Caledonia, Dakar in Senegal, Libreville in Congo, and Obock on the East African coast, at the entrance to the Red Sea. The principal naval school for the training of naval officers is situated at Brest.

HISTORY.

Gallia, or Gaul, was the ancient name under which France was designated by the Romans. They knew little of the country till the time of Cæsar, who, after a series of wars covering seven years, completed its conquest in B.C. 51. At this time it was occupied by three branches of the Celtic race—the Aquitani, the Celtæ, and the Belgæ. There were also some Germanic inhabitants and a few Ligurians and Greeks, but the latter never penetrated far beyond the shores of the Mediterranean, where they planted colonies, the most important of which was Massilia (Marseilles). Under the Roman rule Gaul advanced rapidly in civilization and refinement, and was one of the most important portions of the Empire. (See Gaul.) With the decline of the Roman power in the fifth century it fell completely under the power of the Visigoths, Burgundians, and Franks. In A.D. 486 Clovis, a chief of the Salian Franks, by his victory over Syagrius near Soissons, put an end to the Roman dominion. Clovis embraced Christianity in 496. After his death in 511, his kingdom was divided among his sons, Theodoric, Chlodomer, Childebert, and Clothaire. His dynasty, known as the Merovingian, ended in the person of Childeric III., who was deposed, in 751, after the reality of kingly power had already passed into the hands of the mayor of the palace, Pepin of Heristal, and after him into those of Charles Martel and Pepin the Short, the latter of whom ascended the throne as the first of the Carolingian rulers. (See Franks; Merovingians; Carolingians.) The accession of Pepin gave new vigor to the Frankish monarchy, which, under his son and successor, Charles the Great, crowned Emperor of the West by Pope Leo III. in 800, became a powerful empire. Christianity, civilization, and letters were protected during the reign of Charles the Great, and before his death he had extended the limits of his empire from the Baltic to the Mediterranean, and from the Bay of Biscay to the coast of Illyria. After his reign, however, this vast power crumbled to pieces. By the Treaty of Verdun, in 843, following the death of Louis the Pious, the son of Charles the Great, the Frankish Empire was divided among his sons. The lands east of the Rhine, whose inhabitants were predominantly Teutonic in race and language, were assigned to Louis the German; the part corresponding closely to modern France and the southern part of Belgium (the kingdom of the Western Franks) fell to the possession of Charles the Bald; between the two lay the territories of Lothair, who, in addition, received Italy and the Imperial title. The descendants of Charles the Bald (died 877) possessed little or none of the vigor of the early Carolingians.

Louis the Stammerer (872-879) was the helpless creature of powerful nobles. Louis III. and Karlmann, sons of Louis the Stammerer, were forced to witness the loss of the Rhône Valley and the hostile incursions of the Northmen. In 884 Charles the Fat, King of Germany and of Italy, was made King of the western Franks, thus reuniting the realm of Charles the Great. After a stormy reign of three years, in the course of which Paris all but fell into the hands of the Northmen, he was deposed, and Odo, Count of Paris, was raised to the throne of France. Intestine wars desolated the land, and foreign assailants threatened it on every side. Under Charles the Simple (893-929), the ravages of the Northmen had assumed so persistent a character that the King was glad to purchase immunity from their encroachments by the cession of the territory subsequently known as Normandy (c.911). In the kingdom anarchy reigned paramount, the various governors established an hereditary authority in their several governments, and the Crown was by degrees deprived of the best part of its possessions. The power of some of the vassals surpassed that of the kings; and on the death of Louis V. the Carolingian dynasty was replaced by that of Hugh, Count of Paris, whose son, Hugh Capet, was elected King by the army and consecrated at Rheims in 987. See CAPETIAN DYNASTY.

At this period the greater part of France was held by almost independent lords, and the authority of the Capetian kings for more than a century extended little beyond Paris and Orleans. Among the most important of the great feudal vassals whose possessions made up the lands of the French Crown were the counts of Flanders, Vermandois, and Champagne, the dukes of Normandy, Burgundy, and Aquitaine, and the courts of Anjou and Toulouse. Louis the Fat (1108-37) was the first of the Capetians who ruled with a strong hand. He exalted the power of the Crown at the expense of the feudal nobles, and increased the royal territory. Louis VII. (1137-80), who took part in the Second Crusade, was almost incessantly engaged in war with Henry II. of England, whose marriage with Eleanor of Aquitaine made him master of that region and Poitou, in addition to his hereditary possessions of Normandy and Anjou. Louis's son and successor, Philip Augustus (1180-1223), wrested Normandy, Maine, Anjou, Touraine, and Poitou from John of England, and increased the power of the Crown in other parts of France. He took a personal share in the Third Crusade, and permitted the Pope to organize crusades against the Albigenses in the southern parts of the country. The power of the barons in the south was greatly weakened, and ultimately their territory was merged with the royal domains. By improvements in the administration of justice, the right of appeal to the royal courts was established, and the arbitrary power of the great vassals crippled. It was the policy of Philip Augustus to make use of the clergy and the jurists against the nobles, and it was the jurists especially who aided in the establishment of an absolute monarchy by their introduction of the principles of the old Roman law. Under Philip Augustus, France attained the leading place in Europe. The King knew how to win the friendship of the Pope without yielding to the Papal pretensions. He was powerful enough to defeat Otho IV. of Germany and his allies at Bouvines in 1214—a victory which secured his hold on the territories taken from King John. Improvements in the mode of administering the law were continued under his son, Louis VIII. (1223-26), and his grandson, Louis IX. (1226-70), who is one of the saints of the Catholic Church. Louis IX. engaged in the crusades, and died in an expedition against Tunis. He effected many modifications in the fiscal department, and left the kingdom stronger than ever before. His son, Philip the Bold (1270-85), annexed the county of Toulouse to the royal domains. Philip IV. (1285-1314), surnamed Le Bel, or the Fair, acquired Navarre, Champagne, and Brie by marriage. With a view to securing support against the secular and ecclesiastical nobility, with whom he was constantly at war, Philip gave prominence to the burgher element in the nation, and in 1302 he, for the first time, called together the *états généraux,* or general estates, at which the *tiers état,* or burgher class, appeared, together with the nobles and clergy. These changes were, however, accompanied by innovations in the fiscal and other departments of the Government, which were effected with haste and violence. His tyrannical persecution of the Templars showed the extent to which the regal power could be stretched. At the same time the removal of the seat of the Papacy to Avignon insured to France a predominant influence in European affairs. Under his successors, Louis X. (1314-16), Philip V. (1316-22), and Charles IV. (1322-28), the last direct descendant of the Capetian line, the rule of the kings of France became even more unlimited. Philip VI. (1328-50), the first of the House of Valois, a cousin of Charles IV. and the nephew of Philip IV., ascended the throne in accordance with the Salic law (q.v.). His reign and those of his successors, John the Good (1350-64), and Charles V., the Wise (1364-80), were disturbed by constant wars with Edward III. of England, who laid claim to the throne in right of his mother, a daughter of Philip the Fair. The Hundred Years' War (q.v.) began in 1339. In 1346 the English won a great victory at Crécy. In the battle of Poitiers (1356) John was made captive, and as the war dragged on, the State was reduced to bankruptcy, the nobility excited to rebellion, and the mass of the people greatly impoverished. Debasement of the coinage, onerous taxation, and arbitrary conscriptions brought the country to the verge of ruin, while the victories of England humbled the sovereign, decimated the French armies, and cut down the flower of the nation. The insurrection of the peasantry, known as the Jacquerie, occurred in 1358. The long and weak minority of Edward III.'s grandson, Richard II., diverted the English from the prosecution of their claims to the kingdom of France, which revived somewhat from the effects of its long and disastrous warfare; but during the minority of Charles VI. (1380-1422) the war was renewed with increased vigor on the part of the English nation, who were stimulated by the daring valor of Henry V. The signal victory won by the English at Agincourt in 1415; the treason and rebellion of the French princes of the blood, who governed the larger provinces; the ambition of the several regents, the ultimate imbecility of the King, the profligacy of his queen, and the love of pleasure early evinced by the Dauphin, all combined to aid Henry in his attempts upon the throne. But the premature death of Henry, the persevering spirit of the people, and the extraordinary influence exercised over her countrymen by the Maid of Orleans (see Joan of Arc), concurred in bringing about a reaction, and after a period of anarchy Charles VII., the Victorious (1422-61), was crowned at Rheims. A fierce struggle, however, had still to be waged for the recovery of the French provinces from the hands of the English, who were not driven out from Normandy and Guienne until the middle of the century, when nothing but Calais remained in their possession. Charles obtained from the States General a regular tax (taille) for the maintenance of paid soldiers to keep in check the mercenaries and marauders who pillaged the country. He laid the real foundation for the absolute power of the King by obtaining the support of the third estate.



MAP OF FRANCE SHOWING FORMER PROVINCES.

It remained for his successor, however, completely to break the power of the great vassals of the Crown, and to lay upon the ruins of feudal anarchy the secure foundations of absolutism. Louis XI. (1461-83) brought to the task the manifold resources of a wily, unscrupulous nature, true to the moral type of the Renaissance and to those ideals of statecraft which Machiavelli was soon to formulate in his *Principe*. The essential meanness of his character and of his entire career was atoned for only by the inestimable benefits which he conferred upon his country. Soon after his accession to the throne, the princes of the royal blood formed the League of the Public Weal against Louis, ostensibly in defense of the interests of the States General, but in reality out of fear of the growing power of the monarchy. Forced to yield in the beginning, the King soon turned their own weapon against them. The States General at Tours, in 1468, summoned to consider the question of reforms in the administration and the finances, revoked nearly all of the concessions which the princes had succeeded in extorting from Louis in the Treaty of Conflans, three years before. In Charles the Bold of Burgundy, Louis encountered a formidable rival, who bade fair to erect between France and Germany a kingdom more powerful than either; but Charles fell in battle against the Swiss in 1477, and of his possessions the Duchy of Burgundy passed to France. Louis XI. did not live to consolidate all of France under the Crown; but before his death the royal power had been extended over Berry, Burgundy, Provence, Anjou, Maine, and other regions.

Charles VIII. (1483-98), by his marriage with Anne of Brittany, secured that powerful principality, and consolidated the increasing power of the Crown. His invasion of Italy, in 1494, decided for all the future the relations of France to the other powers of Europe, and may be regarded as marking the beginning of the modern era of international policy. With Charles VIII. ended the direct male succession of the House of Valois. (See Valois, House of.) Louis XII. (1498-1515), known as 'Le père du peuple,' was the only ruler of the Valois-Orleans family. The tendency of his reign was to consolidate the royal power, while the general condition of the people was ameliorated. Louis XII. engaged in bloody wars in Italy for the possession of Lombardy and the Kingdom of Naples, but failed to achieve any permanent conquests. His successor, Francis I. (1515-47), of the Valois-Angoulême branch, still intent upon establishing French dominion in northern Italy, waged endless wars with the Hapsburgs, which wasted the resources of his kingdom. A concordat with the Pope, signed in 1516, secured to the King the right of nominating the Gallican bishops. In the reign of Francis the Assembly of Notables and Deputies superseded the States General. Nevertheless, the arts and literature were encouraged in this reign, as well as in that of the succeeding monarch, Henry II. (1547-59), who continued the struggle with the Hapsburgs. The Emperor Charles V., who had warred successfully against Francis I., being crippled by the events which grew out of his war with German Protestants, Henry seized the opportunity to wrest the bishoprics of Toul, Metz, and Verdun from the German Empire and annex them to France. In this reign began the persecutions of the Huguenots (q.v.).

With the death of Henry II. began a period of strife between factions which lasted for more than thirty years, and brought upon France the full horrors of civil war. The three sons of Henry II., Francis II. (1559-60), Charles IX. (1560-74), and Henry III. (1574-89), were weak-willed and incapable, and the history of their reigns is the story of a ceaseless struggle for mastery on the part of the powerful House of Guise, carried on under the pretense of a war for religion. Opposed to them were the Huguenots, led at first by the Prince of Condé and the great Coligny, and later by Henry of Navarre. Between the two, and playing off one against the other, was the gifted and unscrupulous Queen-mother, Catharine de' Medici. Nine civil wars were fought in the space of a generation (beginning with 1562), wars in which the Huguenots did not hesitate to call in foreign aid against their enemies, nor both parties to employ perjury and assassination. The massacre of Saint Bartholomew (see BARTHOLOMEW, MASSACRE OF SAINT) perpetrated by Catharine de' Medici with the aid of the Guises, crushed the Huguenots into non-resistance for some five years, but served only to increase the power of the Guise family, who, as heads of the Catholic League, sought to exclude Henry of Navarre, the rightful heir to the throne, from the succession. Henry III., who thought his own life and crown in danger, caused the Duke of Guise and his brother, the Cardinal of Lorraine, to be assassinated (1588); but perished himself by the assassin's knife in the following year, and the crown passed from the House of Valois.

The accession of Henry IV. of Navarre (1589-1610), a Bourbon prince, descended from a younger son of Saint Louis, allayed the fury of the religious wars, but his conversion to Catholicism estranged his own party, for whom, however, religious toleration was secured by the Edict of Nantes (1598). The early part of his reign was disturbed by mutinies of the troops and the rebellions of the nobles. By degrees, however, Henry, through the astute policy of his Minister, Sully, and by his own personal popularity, raised the power of the Crown higher than ever, while he began a system of thorough administrative reform, which was arrested only by his death at the hands of the fanatic Ravaillac in 1610. The first permanent French settlements in Canada were established under Henry IV.

During the first years of the reign of Louis XIII. (1610-43), the Government was in the hands of the Queen-mother, Maria de' Medici. The year 1614 is noteworthy as the date of the last meeting of the States General before 1789. After 1624 the real ruler of France was Cardinal Richelieu. His acquisition to power speedily put an end to the political intrigues which had disturbed the country during the regency of Maria de' Medici and the personal rule of Louis. Richelieu relentlessly repressed the risings of the Huguenots, who, under their ambitious leaders of the House of Condé, had become a menace to the State. La Rochelle, the last of their places of refuge, was taken in 1628, and Protestantism as a political force ceased to exist in France. The Huguenots, however, were not molested in the free practice of their religion, as guaranteed by the Edict of Nantes. Abroad, Richelieu carried on with marked success the contest against the House of Austria, which Henry IV. was about to resume at the time of his death. The Thirty Years' War in Germany afforded him the opportunity. Gustavus Adolphus was maintained largely by French subsidies, and after 1635 it was French aid that made possible the victorious campaigns of Bernhard of Weiman, Torstenson, and Baner. Alsace was acquired in 1639, and (though Richelieu did not live to see this) by the Peace of Westphalia (1648) France was confirmed in the possession of the bishoprics of Metz, Toul, and Verdun, and secured the right to intervene in the affairs of Germany as one of the guarantors of peace.

During the minority of Louis XIV. (1643-1715), Cardinal Mazarin exerted the chief authority under the regent, the Queen-mother, Anne of Austria. The refractory attitude of the Parlement of Paris and the repression of the nobility gave rise to another civil war (see FRONDE), but with the assumption of power by young Louis (1661), a new era commenced. Supported by the financial ability of Colbert, the military genius of Turenne, the engineering skill of Vauban, and the organizing talent of Louvois, Louis made France the great power of Europe. Franche-Comté and a part of Flanders were added to France by the Treaty of Nimeguen (1678). The ambitious schemes of Louis forced the powers of Europe in self-preservation to unite against him. Within, Louis reigned as absolute monarch, concentrating all the power of Government in himself. The progress of the people in the arts of peace was accomplished with rapid strides. Under the inspiration of the *Grand Monarque* French society attained a degree of culture and refinement that had not been known even in the days of the Italian Renaissance. This, too, was the Golden Age of French literature. The French language and customs exercised an immense influence on the manners of the higher classes throughout Europe, being not the least potent in distant and barbaric Russia. The Court of Louis XIV. became the model for European princes. There was, however, a dark side to the picture. The oppressive war taxes, the prodigality of the Court, the luxurious lives of the clergy, and the absolutism and bigotry of the aged monarch, combined to undermine the foundations of national prosperity and freedom. The latter part of Louis XIV.'s life was marked by a long series of misfortunes. The French armies were repeatedly defeated, the prestige of France was destroyed, and only the jealousy of its enemies saved it from utter humiliation. The War of the League of Augsburg (1689-97) was marked by the defeat of the French in the naval battle of La Hogue (1692), which wrested from them the mastery of the seas. With the outbreak of the War of the Spanish Succession (see SUCCESSION WAR) came the downfall. Louis XV. (1715-74) succeeded to a heritage whose glory was tarnished, and to a throne whose stability was shaken to its very foundations. The reign of Louis XV. presents nothing worthy of notice except the acceleration in the process of dissolution of the monarchy and the development of revolutionary influences. The regency of the profligate Duke of Orléans brought the nation to the verge of bankruptcy. The struggle with England in the Seven Years' War (q.v.) stripped France of Canada and Louisiana, while the capricious change of policy which the King's mistress, Mme. de Pompadour, forced upon the Government, brought contempt upon the country. The close of this reign was further disturbed by the cabals of the Jesuits, who were finally banished in 1764. In 1774 Louis XVI., a well-meaning but weak prince, succeeded to the throne and to the consequences of all the errors of his predecessors. His first ministers, Maurepas, Turgot, and Malesherbes, failed in their attempts to carry out the necessary reforms, and were compelled to yield to the intrigues of the nobility, and resign their places. They were succeeded by the financier Necker, who endeavored, by economy and method, to arrest the impending bankruptcy of the State, and succeeding ministers (Calonne, Lomène de Brienne) made futile attempts to diminish these financial disorders by new forms of taxation, which were generally opposed by the Court. The nobles, the clergy, and the third estate were alike clamorous for a meeting of the States General, the privileged estates wishing to impose new taxes on the nation, and the third estate determined to inaugurate a thorough and systematic reform. After much opposition on the part of the King and Court, the States General, which had not met since 1614, assembled at Versailles on May 5, 1789.

France was ripe for revolution. Thoroughgoing reforms at the beginning of Louis XVI.'s reign might have averted the catastrophe, but a vacillating King, and ministers strong enough to aspire after the good without the power to achieve it, had served only to intensify the feeling of universal discontent, and to bring out in greater contrast than ever the irreconcilable antagonism between the new spirit of the age and the antiquated forms of government and society in France. In other countries of Europe, perhaps, the condition of the lower classes was as unhappy, the incapacity of Government as apparent, the survival of feudal customs as oppressive as in France; but in France alone had the newer intellectual life developed such activity as to render it incompatible with the continued existence of ancient institutions. Absolutism in France had been developed at the expense of feudal rights and popular liberties, and had drawn to itself almost all the functions of national life; but absolutism since the time of Louis XIV. had failed in its duty to the nation, and appears in the *ancien régime* as a ponderous, rusty machine, making itself felt chiefly by its weight.

Under the old régime the internal administration of the country rested in the hands of the King's Council and of the Comptroller-General. Finance, justice, and legislation were all under the control of this powerful Minister, who acted in conjunction with various subsidiary councils. The country was divided into 32 provinces or generalities, each under an intendant, who was the agent of, and responsible to, the Comptroller-General. Except in the *pays d'état*, where the local magistrates retained some measure of self-government, the intendant united in himself the various functions of administration: police, public works, the care of the poor, and, chief of all, taxation. Through his subdelegates he collected every year the amount of the taille and other direct taxes assessed upon the province by the King's Council. The process of administration was cumbersome. Minute matters of local importance had to be passed upon by the Comptroller-General in Paris, and as a result, the provincial administration, though meaning probably to be neither harsh nor unjust, succeeded for the most part in being both.

Socially, the people of France were divided into two great classes—those who paid the taille, and those who did not. Among the latter were the nobility, numbering some 140,000 souls, and owning about one-fifth of the soil. They held exclusive possession of the high offices at Court; they were exempt from the *corvée* or forced work on the roads, and from service in the militia. Originally exempted from payment of the taille, because it was regarded as a commutation paid by the lower classes in lieu of military service, the nobles retained their exemption long after they had ceased to render military service. In the payment of indirect taxes, they also succeeded in evading a large part of their share. For the nobles there were the old privileges and immunities, the ancient rights of fines and dues and tithes, of hunting and fishing and warren, of toll on mill and wine-press; but the ancient service of protection and of guidance to the vassal were gone. A distinction, however, should be made between the Court nobility, who lived in magnificence at Paris or Versailles, and aided in heaping up the enormous deficit, with which the extravagance of the Court was weighing down the country, and the country nobles, who constituted the great body of the class, and lived in retirement on their estates, poor, inactive, since absolutism would make no use of them as its agents, and a burden, though very often an unwilling burden, to their tenants. The Church comprised some 60,000 monks and nuns, and 70,000 of the secular clergy. Between the prelates of the Church and the great body of the poor priests was the same gulf that separated the Court nobility from the resident nobles. The mass of the French priesthood was unselfish, devoted, zealous in its duties; but the policy of the Church as a body, guided by its bishops and archbishops, was no less selfish than that of the nobility as a class. Like the nobility, it was eager to escape its fair share of taxation, and hungered after dues and tithes. The Church owned about one-fifth of the land in France, and, with the nobility and the Crown, shifted its burdens upon the remaining two-fifths. Privilege ruled also in the middle classes. In the towns the line of cleavage between the bourgeoisie and the artisan population was definite. Trade and industry were regulated by the guilds after the selfish spirit of mediæval times. Municipal offices were put up by the Government for sale, and as they generally carried with them certain privileges and immunities, chief among them relief from taxation, were greatly sought after. Powerful corporations were as assiduous in swearing off taxes as their modern successors. The rich bourgeoisie, in short, vied with the nobility and the Church in evading the burdens of State.

It was upon the peasantry, then, that the full brunt of taxation fell. Serfdom was almost extinct in France, more than one-fifth of the land was held by peasant proprietors, and, strangely enough, throughout the eighteenth century more and more land passed into the hands of the peasants in spite of the almost intolerable exactions imposed upon them. Yet Taine has calculated that four-fifths of the fruits of the peasants' labors were taken away by the Government in the form of taille, *corvée*, poll-tax, *vingtièmes*, and the *gabelle* or salt tax. The lands of the Church and of the nobles were cultivated by the peasants under the *métayer* system, where the owner supplied the stock and implements, and the peasant the labor, both sharing equally. The general state of agriculture was wretched. The methods pursued were those of the early Middle Ages, want was the chronic condition of the working population, famine a frequent phenomenon, and mendicancy increased to an enormous extent. In 1777 there were one and a quarter million beggars in France. Rioting was frequent and the criminal class drew recruits in plenty from among the proletariat of town and country.

Against the critical and utilitarian spirit of the eighteenth century, the irrational and antiquated in Government and society could not hope to maintain itself. Absolutism was assailed by Montesquieu in his *L'Esprit des lois*, which held up the ideal of constitutional liberty as realized in Great Britain; Voltaire, through long years, fought the battle of enlightened reason against the absurd and anomalous in Church, State, and society. Rapidly the conviction grew of the utter worthlessness of existing things, and of the necessity for immediate and radical change. The revolt against the actual attained its climax in Rousseau. In the face of privilege, injustice, and oppression, he invoked the law of nature to establish the equality of man. To the peasantry and the artisan class equality meant the just redistribution of public burdens; to the cultured, ambitious bourgeoisie, an equal opportunity with the nobles for sharing in the national life.

For an account of the period from 1789 to 1799, see FRENCH REVOLUTION, THE.

Bonaparte showed consummate skill in reorganizing and centralizing the Government, which had been too much localized under the Revolution. He then took the field in the spring of 1800, led an army over the Alps, and attacked the Austrians in Italy, while Moreau was intrusted with the conduct of the campaign in southern Germany. The victories of Marengo and Hohenlinden decided the fate of the war. In 1801 the Peace of Lunéville was concluded with Austria and the German Empire, and the boundaries of France were extended to the Rhine. In the Peace of Amiens in 1802, England recognized the changes wrought by the Revolution and Bonaparte in the map of Europe. The period of respite from war was employed by the First Consul in revivifying trade and industry, and in obliterating, both in private and public life, the devastations wrought by the Reign of Terror. In 1804, after an appeal through universal suffrage to the nation, Bonaparte became Emperor, as Napoleon I. The Pope came to Paris to crown Napoleon and his wife, Josephine; a new nobility was rapidly created, and the relatives and favorites of the Emperor received vanquished kingdoms and principalities at his hands. In 1805 Napoleon assumed the title of King of Italy. Austria, who ventured to rise up against him, was overthrown, together with her ally, Russia, at Austerlitz (1805), and compelled to sign the Peace of Pressburg, by which the existence of the Holy Roman Empire was formally brought to an end. Prussia was humiliated at Jena and Auerstädt (1806), and brought to the verge of destruction; the Russians were overthrown at Friedland (1807), and the Czar was forced to enter into an alliance with the French Emperor (1807), by which the arbitrament of affairs in Europe was divided between the two. In the meanwhile, however, England, having renewed the struggle against France, had gained the complete mastery of the seas by the victory of Trafalgar (1805). Against this arch-enemy Napoleon brought to bear the united strength of Europe in an effort to destroy her commercial supremacy by a system of ruinous blockades. (See CONTINENTAL SYSTEM.) In 1807 the forces of Napoleon invaded Portugal and expelled the reigning family. In 1808 he took possession of Spain, whose inhabitants rose against him, and which became a great battlefield between the English and French. The height of Napoleon's power was attained in 1809, when the Austrians in a third war were overthrown at Wagram, and in the Treaty of Schönbrunn suffered a further loss of territory. By his marriage with the Archduchess Maria Louisa, daughter of the Emperor of Austria, Napoleon attempted to give to his throne the prestige of birth, which alone it lacked. For some years, while his military operations were confined to the Spanish Peninsula, Napoleon could devote his energies toward consolidating his government and organizing a thoroughly centralized administration. His impress on the character of French institutions has persisted to the present day; the legal system of France is based primarily on the Code Napoléon (1804), and the relations between Church and State are still largely determined by the Concordat which the Emperor concluded with the Pope in 1801. This period, however, was the poorest in respect to the literary and scientific development of the nation, for men were too much trammeled by police supervision and military discipline to exercise freedom of thought.

The disastrous Russian campaign of 1812 was the beginning of Napoleon's downfall. Of the grand army of more than 500,000 men which he led into Russia in June, only 100,000 recrossed the Niemen in December under the command of

Murat, the Emperor having hastened to France to raise new levies. Europe now rose against the conqueror. In February, 1813, Prussia entered into an alliance with Russia, and these powers were soon joined by Austria and Sweden. Napoleon defeated the Russians and Prussians at Lützen and Bautzen in May, and gained a splendid victory over the Allies at Dresden in August; but in October he was overwhelmed in the great battle of Leipzig. He was driven from Germany; France was invaded, and on March 30th Paris surrendered to the Allies.

Napoleon was compelled to abdicate and retired to the island of Elba, the sovereignty of which had been granted to him. His family were declared to have forfeited the French throne. Of all her conquests France was allowed to retain only a few strips of territory on her eastern border, together with Avignon and Venaissin. On May 3d Louis XVIII., the brother of Louis XVI., made his entry into Paris, and the period of the First Restoration began.

The conduct of the restored Bourbons was not such as to conciliate the nation; they returned loaded with debts, and surrounded by the old nobility and clergy, who had not learned to renounce their former privileges, and who looked upon the generation of Frenchmen which had arisen during their absence as their natural enemies. The hopes of a liberal government, aroused by the granting of a constitution in the Charte Constitutionelle (June 4, 1814), failed of realization. A narrow spirit influenced the policy of the King, which led to the establishment of a strict censorship, the extension of the powers of the police, and the persecution of all the adherents of the Empire. The lower classes and the army, who were alike sensible of the humiliating reaction which had followed the former excitement of war and conquest, were treated by the returned émigrés with indifference and contempt. The general discontent with the monarchy afforded the exiled Emperor an opportunity of which he was not slow to avail himself. On February 26, 1815, Napoleon left Elba and on March 1st he landed in France. Crowds followed him; the soldiers of the Empire flocked around his standard, and the Bourbons fled before him. The news of his landing spread consternation throughout Europe. The deliberations of the Congress of Vienna (q.v.) were suspended; and on March 25th a treaty of alliance was signed at Vienna between Austria, Russia, Prussia, and England, and preparations were at once made to put down Napoleon and restore the Bourbon dynasty. At first the prestige of success seemed to attend Napoleon, but on June 18th he met his final defeat at Waterloo (q.v.). On July 8th Louis XVIII. reëntered Paris. A week later Napoleon gave himself up to the English and was sent to the island of Saint Helena.

The Second Restoration gave occasion to many pledges of a more liberal policy on the part of Louis, but these were disregarded in the Royalist reaction that now set in. In spite of the King's promises of amnesty, many of those who had gone over to Napoleon during the Hundred Days were brought to trial before tribunals expressly instituted for that purpose. The most prominent of the victims was Ney, who was found guilty of treason, and shot December 7, 1815. A number of peers, created by Napoleon, were expelled from the Upper Chamber. In some of the provinces the adherents of the Bourbons entered upon a course of violence and murder, the so-called 'White Terror.' Long after physical violence subsided, reactionary legislation went on. The suffrage law was repeatedly tampered with, until the preponderance of power had been placed in the hands of the great land-owners. In matters of public education the King was completely under the control of the clergy, who constituted the extreme party among the reactionists. In 1824 Louis XVIII. was succeeded by his brother, the Duc d'Artois, as Charles X. Ministerial incapacity, want of good faith, general discontent, and excessive priestly influence characterized this reign, which was abruptly brought to a close by the revolution of July, 1830. With Charles X. the direct line of the House of Bourbon came to an end. Louis Philippe, Duke of Orleans, was elevated to the throne by the will of the people. The first years of the reign of this 'Citizen King,' who was the representative of the prosperous commercial and industrial classes, was disturbed by insurrectionary riots of the silk-weavers in Lyons and disturbances in Paris. Attempts on the King's life were frequent; but the progress in material prosperity made the Government popular with the bourgeoisie, and for a time it held its ground. The warlike propensities of the nation found an outlet in the conquest of Algeria (1830-47). But the determined resistance of the King to the growing demand for electoral reform led at last to open insurrection in Paris. Louis Philippe abdicated, February 24, 1848. A provisional government was at once instituted, including such men as Dupont de l'Eure, Lamartine, Ledru-Rollin, Etienne Arago, Crémieux, and Garnier-Pagès. On February 27th the Second Republic was formally proclaimed. Under the auspices of Louis Blanc the new Government proceeded at once to exert the activities of the State in behalf of the working classes, for whom it was proposed to establish national workshops. On April 27th a decree was issued abolishing slavery in the French colonies. In the meanwhile elections were held for a Constituent Assembly, which met on May 4th, and which a few days later elected an Executive Commission to conduct the affairs of the Republic. The radical Republicans (the so-called Red Republicans) and the disappointed Socialists soon manifested their hostility to the new order by a resort to arms. There were Red Republican disturbances in Paris on May 15th, and a great Socialistic uprising in the capital, June 24th-26th, in which a large mass of the Parisian populace was involved, was suppressed by General Cavaignac only after terrible bloodshed. On November 4th the Constituent Assembly completed the framing of a regular republican constitution for France, and on December 10, 1848, Louis Napoleon, nephew of Napoleon I., was elected President, entering upon his office December 20th. One of the first acts of the Administration of Louis Napoleon was the sending of a French expedition for the restoration of the temporal power of Pope Pius IX., which was accomplished in July, 1849. In May, 1849, the Constituent Assembly closed its sessions and was succeeded by the Legislative Assembly. The President betrayed the true nature of his policy by appointing on October 31, 1849, a thoroughly Bonapartist Ministry. (See NAPOLEON III.) By the famous coup d'état of December 2, 1851, he violently set aside the Constitution, and assumed dictatorial powers. He adopted his uncle's methods in many ways, concealed his seizure of the title by a sham plébiscite, and became Emperor of the French, December 2, 1852.

Napoleon III. established a government which was virtually a perfected absolutism, veiled by the forms of a parliamentary régime and a system of universal suffrage controlled by the agents of the Emperor. There was a Senate, which was the guardian of the Constitution, and a legislative body; but the Senate was almost entirely appointed by the Emperor, and in the Lower House there was no freedom of debate. The freedom of the press was practically abolished. Force, however, could not be depended upon as a permanent sanction of legitimacy, and to secure the support of the people it was necessary for Napoleon to enter upon a brilliant foreign policy. The alliance of England and France against Russia in 1854 and the outcome of the Crimean War were personal triumphs for the Emperor. With the meeting of the Congress of Paris in 1856 that city became the diplomatic capital of Europe. The Emperor aspired now to play the rôle of arbiter of Europe. In 1859, as the champion of oppressed nationalities, he came to the aid of Italy against Austria, and as a reward obtained possession of Savoy and Nice. He failed, however, in his attempt at intervention in Poland in 1863 and in the affair of Schleswig-Holstein in the following year. Actuated, perhaps, by the dream of a French hegemony in Latin America, he seized upon the disturbed condition of Mexico as an opportunity for invading that country and establishing a dependent empire there under Maximilian of Austria. The fall of Maximilian's empire in Mexico was a fatal blow at his prestige. The defeat of Austria, in 1866, and the consequent rise of Prussia, threatened to deprive France of the leading position she occupied in European affairs. At home, the period of the Second Empire was marked by great industrial development. Stimulated by the magnificence of the Court, life took on an aspect of almost reckless luxuriousness. Vast fortunes were made in railroad building, Government contracts, and speculation. A great system of public works was carried out, including the building up of a new and beautiful Paris. (See HAUSSMAN.) The international expositions of 1855 and 1867 testified to the prosperity of the country. Nevertheless, signs of dissatisfaction were not wanting, and after 1863, in proportion as Napoleon's foreign policy broke down, discontent and criticism grew loud in France. As early as 1862 the Emperor was compelled to allow some measure of debate in the legislative bodies, and in 1867 this was largely increased. Opposition to the Empire, however, grew bolder and fiercer, until in 1869 the Emperor saw himself driven to grant a responsible Ministry. It was soon found that the responsibility of the Ministry was fictitious, and that the Emperor availed himself of its protection to cloak his own acts of personal government. The result of the appeal made to the nation in 1870, on the plea of securing its sanction for his policy, was not what he had anticipated; and the 50,000 dissentient votes given by the troops in this plébiscite revealed a hitherto unsuspected source of danger. The necessity, however, of regaining his lost prestige by a brilliant foreign policy, led him to enter once more upon an aggressive course of action in European affairs. The question of the succession to the vacant Spanish throne precipitated a crisis between France and the Prussian Government, whose foreign policy was guided by the genius of Bismarck. Deceived by the false representations of his Ministers with regard to the efficiency and preparedness of the French Army, Napoleon allowed himself to be carried into war with a power which but recently (see SEVEN WEEKS' WAR) had revealed its surpassing military strength, and which, since its triumph over Austria in 1866, had been silently preparing for the decisive conflict with the ancient enemy of Germany. Rarely has the bubble of power been so suddenly pricked as in the case of Imperial France in 1870. (See FRANCO-GERMAN WAR OF 1870-71.) After a quick succession of utter defeats for the French, Napoleon surrendered at Sedan, September 2, 1870. On September 4th the Corps Législatif declared the Emperor and his descendants forever excluded from the throne, and created a Government of National Defense. France was proclaimed a republic. A period of stress and disorder ensued. An armistice in January, 1871, was followed by the meeting of the first National Assembly of the Third Republic at Bordeaux in February. The preliminary treaty of peace with Germany was signed at Versailles on February 26th and ratified by the National Assembly on March 1st. France agreed to cede Alsace, together with parts of Lorraine, including Metz, and to pay an indemnity of 5,000,000,000 francs. Not until the final payment of the enormous war indemnity in September, 1873, was France wholly freed from the humiliating occupation by foreign troops. In the spring of 1871 the violent outbreak of the Commune (q.v.) at Paris convulsed France. On August 31, 1871, Thiers, who had been elected Chief of the Executive by the National Assembly in February, received from that body the title of President of the Republic.

There was not for years a true republican majority in France, but the adherents of the Republic were able to hold their own because of the divisions in the ranks of the Monarchists. (See POLITICAL PARTIES, paragraph on France.) In 1873 Thiers resigned the Presidency, and Marshal MacMahon was elected by Monarchist votes, and confirmed in the Presidency for a period of seven years (the Septennate). In 1875 the Assembly adopted laws providing for the constitution of the National Legislature, the legislative power to be vested in a Senate and a Chamber of Deputies. In 1877 President MacMahon was suspected of reactionary designs; but the republican form of government was, nevertheless, greatly consolidated during his tenure of office, and continued to enjoy the increasing confidence of the nation. On the resignation of MacMahon, in 1879, Jules Grévy was elected to succeed him.

After 1879, under various changes of Ministry, the policy of the Government continued steadily republican. At the instance of Jules Ferry, a decree was issued in 1880 by which the Jesuit schools were closed, and all religious orders that would not submit to certain conditions necessary to gain the State sanction were dissolved. In 1884 the Constitution and the Senatorial electoral system were revised and put upon their present basis. Members of the royal houses that had formerly ruled France were declared ineligible for military or civil office. In 1881 France entered upon an active colonial policy by undertaking a military expedition to Tunis and establishing a protectorate over the country. In 1883 France enforced a claim of certain rights over the northwestern part of Madagascar by taking possession of several ports. Rapidly extending its influence in spite of considerable reverses, it succeeded in establishing a protectorate over the island in 1885, and in 1896 reduced Madagascar to the rank of a French possession. The advance of France in Indo-China led to war with China in 1883-85, which resulted in the establishment of a French protectorate over Annam and Tongking. M. Grévy was reelected in 1885, but resigned in 1887. He was succeeded by Sadi Carnot, in whose Administration the Panama Canal scandal occurred, involving many prominent men and weakening the Government.

The Carnot Administration, too, witnessed the most formidable of all the attempts made to overthrow the Third Republic. This was the agitation commenced by all the discontented elements, representing every possible shade of political opinion, and united only by their hostility to the existing Government, under the leadership of General Boulanger (1888). For a time it seemed as if the Republic was fated to fall before a coup d'état. Boulanger, however, lacked the requisite decision of character, lost his popularity, and ultimately fled the country. Orleanists, Bonapartists, and Radicals alike had contributed toward his success, and the personal revelations made by Mermeix, which revealed the true character of Boulanger, not only discredited the opposition, but caused a very strong reaction in favor of the Government. This growth of republican sentiment received an additional impulse in 1891, when Cardinal Lavigerie, the head of the Clerical Party in France, declared himself in favor of the Republic. This declaration was a great blow to the Royalists, whose chief strength has always lain in their connection with the Church. In 1894 President Carnot was assassinated at Lyons by an Italian anarchist, and was succeeded by Casimir-Périer, who resigned in January, 1895, and was succeeded by Félix Faure. The strengthening of the Franco-Russian *entente* was the most notable fact of these years, and after that the Dreyfus case. (See Dreyfus.) Emile Loubet was elected President in 1899, upon the death of President Faure. A detailed account of the last twenty years of French political history will be found under Political Parties.

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FRANCE, Isle of. See Mauritius.

FRANCE, Reformed Church of. See Huguenots.

FRANCE, fräɴs, Anatole (1844—). The assumed name of Jacques Anatole Thibault, a noted French critic, a distinguished novelist and the most graceful humorist of contemporary France. His early poems (1873 and 1876) are negligible, as is the humorous story, *Jocaste et le chat maigre* (1879), but *Le crime de Sylvestre Bonnard* (1881, often translated) is a charming idyl of child and scholar's life, full of genial irony that grows more caustic in *Balthasar* (1889), while in *La rôtisserie de la reine Pédauque* (1893), and *Opinions de M. l'Abbé Jérôme Coignard* (1893), the story is little more than a veil for the expression of an epicurean skepticism. His latest stories, *L'orme du mail* (1897), *Le mannequin d'osier* (1898), *L'anneau d'améthyste* (1898), *Monsieur Bergeret à Paris* (1900), frankly call themselves *Histoire contemporaine* and seek to reflect the thoughts of typical Frenchmen of culture. All these and his other novels as well, e.g. *Thaïs* (1890), *Le lys rouge* (1894), are the fiction of a critic rather than of a romancer, and his journalistic reviews, *La vie littéraire* (5 vols., 1888-93), as well as his philosophic *Le jardin d'Epicure* (1895), show more of the spirit of Renan than that of any other; yet France has in him something, too, of Racine, of Voltaire, and of Flaubert. France is perhaps "the ultimate flowering of the French genius," as Lemaître, himself a great critic, has said of him.

FRANCE, Joseph (1787-1869). A French publicist and reformer, born in Lorraine. He entered the army in 1815, obtained a commission in the gendarmerie in the West Indies, and was stationed in Martinique, where he rose to the rank of colonel in 1834. From 1836 to 1846 he had supreme command of the military police in the island, and by his humanity, impartiality, and firmness endeared himself to the lower classes of the population, and to the slaves in particular, who looked upon him as their champion. To this title he actually won the right when, in 1841, he published *La vérité et des faits, ou l'esclavage à nu,* in which he set forth the cruelties of the colonists toward the negroes. This work created such a sensation that the Governor, fearing its effects, removed France from his command, and sent him a prisoner to Paris to stand trial for publishing seditious writings. This trial resulted in his losing permanently his commission, but, after the Revolution of 1848, and the abolition of slavery in the colonies, France was chosen by the electors in Martinique to represent them in the Constituent Assembly at Paris. From 1852 until his death he was a member of the colonial council of Martinique. Besides numerous contributions to the *Revue Abolitioniste*, he published *Histoire de la Guadeloupe* (1885); *Les corsaires français dans les Antilles* (1857); *Histoire de la filibuste* (1860); *Questions coloniales* (1860); and *Statistique physique et politique de la Martinique* (1861).

FRANCESCA, frȧn-chĕs′kȧ. Piero della (c.1420-92). An Italian painter of the Umbrian School, whose real name was Pietro di Benedetto de' Franceschi. He was born at Borgo San Sepolcro. His work shows the influence of Paolo Uccello (q.v.), and he was an assistant of Dominico Veneziano, from 1439 to 1450, in the painting of the frescoes in the churches of San Egidio and Santa Maria Nuova, Florence. Upon an invitation to Rome by Nicholas V., he painted two frescoes which were destroyed when Raphael painted the Stanze of the Vatican. In 1451 he painted a fresco in the Church of San Francesco at Rimini for Sigismondo Malatesta. He was also invited to Ferrara and assisted in the decoration of the Schifanoia Palace. Francesca was a complete master of oil painting; he was the first to use light to give a subduing effect in color, and to preserve the real value of shadows. There is a dignity in his portraiture; an absence of emotion and a solemnity about his figures. As a student of linear and aërial perspective, he was a forerunner of Leonardo da Vinci, especially in his studies of light and shade and his space values. Two of his most noted pupils were Luca

Signorelli and Melozzo da Forlì. He died October 12, 1492, and was buried in the cathedral of his native place. Some of his principal works are: "Saviour Rising from His Tomb," museum at Borgo San Sepolcro; altar-piece, "Virgin and Child," Church of the Misericordia at Borgo San Sepolcro; "Nativity," unfinished, at the National Gallery, London; a number of works at Florence, Perugia, and Venice. Consult: Müntz, *Le tour du monde* (Paris, 1883); Vasari, *Vite*, ed. by Milanesi (Florence, 1878-85), English translation, Blashfield and Hopkins (New York, 1897); and Waters, *Piero della Francesca* (London, 1901).

FRANCESCA DA RIMINI, dȧ rē̍/mē-nē (?-c. 1288). The daughter of Guido da Polenta, the Lord of Ravenna. She was given by him in marriage to Giovanni, sometimes called Gianciotto, or Sciancato (the Lame), the second son of Malatesta, the podestà of Rimini. Malatesta was a Guelph leader who had made himself the master of all the region about Rimini. He had, besides Giovanni, a son, Paolo, called the Handsome, whom Giovanni sent to Ravenna to bring back his bride. Francesca and Paolo fell in love, and Giovanni, finding them together, killed them both (c.1288). The tale has many modifications, but this is the simplest outline of the story. It has been made the subject of many pictures and plays. The best known of the pictures are "Paolo and Francesca," by Ingres (1819), in the Antwerp Museum; the same by Ary Scheffer (1835), in the Wallace collection; the same by G. F. Watts (1879), and the "Death of Paolo and Francesca," by Cabanel (1870), in the Luxembourg. Besides Dante and Boccaccio, Leigh Hunt made this story the subject of a poem (1816), Silvio Pellico wrote a tragedy on it (1818), G. H. Boker made an acting version of it (1864), and recently Stephen Phillips produced a dramatic poem (1899), and the Italian poet d'Annunzio a drama (1901). There is an opera of this name by Hermann Götz (1877), which was completed by G. Frank, a symphonic poem for orchestra by Tchaikovsky (1877), and an opera by Ambroise Thomas, *Françoise da Rimini* (1882). Consult Yriarte, *Françoise da Rimini, dans la légende et dans l'histoire* (Paris, 1882).

FRANCESCHINA, frän'chĕs-kē̍'nȧ. The finely drawn chief character in Marston's *Dutch Courtesan.* She is a woman who, with all her attractiveness, is revengeful and implacable.

FRANCESCHINI, frän'chĕs-kē̍'nē, BALDASSARE (1611-89). An Italian painter of the Florentine School. He was born at Volterra, and is also called Volterrano Giuniore, to distinguish him from Daniele da Volterra. He was a pupil of Cosimo Roselli and Giovanni di San Giovannino in Florence, and afterwards studied the antique in Rome. He was a very facile painter, but, like the rest of the Mannerist group, was deficient in technique and in sentiment. His works are principally in Florence, where he painted in the Pitti Palace and in the Uffizi, and at Volterra, especially in the Convent of Santa Badia di San Giusto. His masterpiece is the "Coronation of the Virgin," in Santa Annunziata, Florence.

FRANCESCHINI, frän'chĕs-kē̍'nē, MARC ANTONIO (1648-1729). An Italian painter, born at Bologna. He studied under Galli and was the pupil and friend of Carlo Cignani, and worked with him at Bologna, Modena, Reggio, and elsewhere. One of his greatest paintings, a fresco at the Council Palace in Genoa, representing scenes from the history of the Republic, was destroyed. Others of his large decorative works are frescoes in the Pallavicini and Durazzo palaces in Genoa, and a ceiling in the Ranazzi Palace in Bologna. He was invited to Vienna, and there painted in the Lichtenstein Palace frescoes with scenes from the life of Jacob and Rachel. Franceschini was in many ways a remarkable artist; he had a genius for composition, and all that was mannered and artificial in his imitators was redeemed in him by the fertility of his imagination and the warmth of his color. His easel pictures include "The Annunciation," Bologna gallery; "Birth of Adonis," and "The Magdalen," Dresden gallery; "San Carlo Borromeo Helping the Plague-Stricken," and "Diana," in the Vienna gallery.

FRANCESCO DI PAOLA, frȧn-chĕs'kō dē pou'lȧ. See FRANCIS OF PAOLA.

FRANCHE-COMTÉ, fräNsh' kôN'tā' (Fr., free county). An old province in the east of France, in the basin of the Rhône, comprising what now forms practically the departments of Doubs, Haute-Saône, and Jura, and part of the Department of Ain. It was inhabited in ancient times by the Sequani, and was the *Maxima Sequanorum* of the Romans. In the fifth century it was conquered by the Burgundians, and later formed part of the Frankish monarchy. It passed afterwards through various hands, until, in 1156, it came into the possession of the Emperor Frederick Barbarossa. In 1384 it was annexed by Philip the Bold of Burgundy. Through the marriage of Mary of Burgundy to Maximilian, Franche-Comté became a possession of the Hapsburgs, and, together with the Netherlands, it passed to the Spanish branch of that house. The acquisition of the region was one of the chief objects of Louis XIV.'s external policy; his armies overran the province in 1668 and 1674, and he was confirmed in his conquest by the Treaty of Nimeguen (1678). The name first appears in the twelfth century, and indicates freedom from Imperial taxation, except the annual gift to the sovereign of a stipulated sum. Its old capital was Besançon.

FRANCHETTI, frȧn-kĕt'tē, BARON ALBERTO (1860—). An Italian operatic composer, born at Turin. He was a pupil of Nicolò Coccon and Fortunato Magi. Proceeding to Dresden, he studied under Draeseke, after which he entered the Munich Conservatory. He belongs to the new school of Italian composers, and is regarded as one of its most successful exponents. His principal and most important opera was the four-act drama legend *Asraële*, produced in 1888. Other and scarcely less successful operas are: *Cristoforo Colombo* (1892); *Fior d'Alpe* (1894); *Il signor di Pourceaugnac* (1897). He also wrote many smaller works, the best of which is a symphony in E minor.

FRANCHEVILLE, fräNsh'vēl', or **FRANQUEVILLE,** fräNk'vēl', PIERRE (1548-c.1618). A French sculptor, born at Cambrai. Against his parents' wishes he went to Paris in 1564 to study art, and, recalled home to follow a literary career, left his country secretly, making his way to Germany and Austria.

At Innsbruck he found a patron in the Archduke Ferdinand, who enabled him to study under Giovanni da Bologna at Florence. He assisted that famous master in many of his works; also accompanied him to Genoa, where the statues of "The Four Evangelists," in the cathedral, bear witness to his early proficiency. The rapidly increasing reputation acquired by such works as the "Allegorical Figures of Humility, Chastity, and Wisdom," in the Nicoline Chapel at Florence, led to his being summoned to Paris in 1601 by Henry IV., who appointed him Court sculptor. In that capacity he executed numerous statues, busts, and vases for the royal palaces and gardens. Prominent among these are "David with the Head of Goliath" (1612); "The Conquered Nations" (1614), four figures, formerly part of the equestrian monument of Henry IV.; and "Orpheus," all in the Louvre. He was a man of great versatility, and active as an architect, painter, and writer.

FRANCHI, frän′kẽ, Ansonio (1821-95). The pseudonym of Cristoforo Bonavino, an Italian philosopher, born at Pegli, near Genoa. He was ordained a priest, but abandoned this career, and gave himself to the study of philosophy, under the name of Franchi, by which he was always known. He became professor at the University of Padua in 1860, and at the Academy of Milan in 1863. Among his works are: *La filosofia delle scuole italiane* (1863); *La religione del secolo XIX.* (1860); *Del sentimento* (1854); *Il razionalismo del popolo* (1862); *Saggi di critica e polemica* (1871); and *Lettere su la teorica del guidizio* (1870).

FRANCHI, Fabian and Louis dei. In Boucicault's drama *The Corsican Brothers*, the twin brothers whose mysterious sympathy is the basis of the play.

FRANCHISE. In England, a royal privilege, or branch of the Crown's prerogative, subsisting in the hands of the subject. Being derived from the Crown, franchises must arise from royal grant, or in some cases may be held by prescription, which presupposes a grant. The subjects of franchise correspond with what in Scotland are called regalia (q.v.). The right to take waifs, estrays, wrecks, treasure-trove, royal fish, and forfeitures, all of which are the prerogatives of the Crown, are franchises. The rights of forest, chase, park, warren, and fishery are also franchises, no subject being entitled so to apply his property for his own convenience. A county palatine (see Palatine) is the highest species of franchise, as within it the earl, constable, or other chief officer may exercise without control the highest functions of the sovereign. And as the Crown may thus erect an entire county into an independent jurisdiction, so it may create a liberty of bailiwick independent of the sheriff of the county, and bestow the privilege as a franchise. It is likewise a franchise for a number of persons to be incorporated, and subsist as a body politic, with a power to maintain perpetual succession, and do other corporate acts; and each individual member of such corporation is also said to have a franchise or freedom. The right to hold a fair or market, or to establish a ferry and to levy tolls therein, is also a franchise. Where the holder of a franchise is disturbed in his right he may sue for damages by an action on the case; or in the case of non-payment of tolls he has the remedy of distress (q.v.). Viewed as property a franchise is an incorporeal hereditament (q.v.), and contains an implied covenant on the part of the Government not to abrogate or invade the right vested by it in the grantee, and on the part of the latter to perform all the duties which it imposes, and to exercise his right and privileges under it in a faithful and reasonable manner. When a franchise is granted on a valuable consideration, as in the case of a private corporation, it is in the nature of a contract between the Government and the grantee, and is protected from legislative interference in this country by constitutional provisions prohibiting the enactment of laws which impair the obligation of contracts. (See Dartmouth College Case.) On the other hand, the franchise is affected with a *jus publicus*, which secures to the State the power of regulating the conduct of a corporation, and even of destroying it by way of punishment for any grave abuse of its privileges.

As a political term, franchise denotes the right of suffrage. In England the qualifications of voters for members of Parliament are quite different from those of voters at municipal and other local elections. In this country the conditions of elective franchise are generally, though not always, the same for Federal, State, and municipal purposes. Consult: Pollock and Maitland, *History of English Law* (2d ed., London, 1899); Kent, *Commentaries; Encyclopædia of the Laws of England;* Taylor, *Treatise on the Law of Private Corporations* (New York, 1902).

FRANCIA, frän′chȧ (1450-1518). An Italian painter, goldsmith, and sculptor of the Early Renaissance, whose real name was Francesco di Marco Raibolini. He was the chief master of the early Bolognese School of Painting (q.v.). He was born at Bologna, the son of a carpenter, and until his fortieth year practiced the goldsmith trade. In this he achieved high distinction, having been repeatedly steward of the goldsmiths' guild, and in 1514 steward of the Four Arts. He was famous as a medalist and as a worker in niello. Two charming niello plates at the Academy of Bologna are ascribed to him, as is also a small relief portrait of Giovanni II. Bentivoglio in San Giacomo Maggiore. The ruling house of Bentivoglio named him master of the mint, and upon its expulsion Pope Julius II. confirmed him in this office.

Francia's earliest dated paintings (1490) show the influence of Lorenzo Costa, who was then at Bologna, and who probably taught him painting. The metallic character of his first pictures, and their strong outlines, point to his former profession. But Francia soon outgrew his colleague, both in color and in drawing, although Costa was more imaginative and dramatic. There also appears in his works a sentiment reminiscent of the Umbrian masters.

Among his earlier paintings are a "Madonna," in the Museum of Berlin, and a dead "Saint Stephen," in the Borghese Palace, Rome. The Pinacoteca of Bologna has a fine "Madonna Enthroned," a "Nativity," and a "Dead Christ"; the Brera (Milan), an "Annunciation"; the Louvre, a "Crucifixion, with Job;" Berlin, a "Virgin in Glory" (1502). The "Virgin in a Rose Garden Adoring the Christ-Child," in the Munich Gallery, a picture of highest poetic charm, and well executed, is probably by him, although Morelli ascribes it to Francia's pupils. Another fine example of his work is the Bentivoglio altarpiece in San Giacomo Maggiore, Bologna.

All of his paintings, though charming in sentiment, lack dramatic action; they are groups of charmingly isolated figures, rather than connected compositions. Nevertheless, in his later works we find a vein of dramatic action, and an increased nobility of form and conception. These are due, to some extent, to the influence of Raphael. The reputed correspondence between Francia and Raphael and Francia's sonnet to the master are forgeries of a later date, but Francia may well have seen works of Raphael at Bologna. Among the works showing the influence of Raphael are the "Virgin Enthroned" in the National Gallery (London); the "Coronation of the Virgin," in the Cathedral of Ferrara; and the "Assumption of the Virgin," in San Frediando, Lucca. Other examples are the "Deposition from the Cross," in the Parma Gallery; the "Adoration of the Kings," at Dresden; and a portrait of an "Unknown Man" attributed to Raphael, in the Lichtenstein Gallery, Vienna. His frescoes in the Oratory of Santa Cecilia, Bologna, representing the "Marriage of the Saint with Saint Valerian" and her "Burial," are among the finest of his works.

Francia was much grieved by the exile of the Bentivogli in 1506. He was patronized by Pope Julius II., and remained at Bologna. His style underwent no change, but his last works show decline. He died at Bologna, January 5, 1518.

Francia's sons, GIACOMO (died 1557) and GIULIO (1487-1543), painted in their father's manner, but were much inferior to him. They worked together, signing their works J. J. Francia, and examples of their joint efforts exist in the Galleries of Bologna, Parma, and Berlin. Giacomo, who was the better painter, subsequently came under the influence of Dosso Dossi (q.v.). Specimens of his independent work are in the Museum of Berlin, the churches and Gallery of Bologna, and in the Brera, Milan.

Consult: Vasari, *Vite dei Pittori*, etc., ed. Milanesi, vol. ii. (Florence, 1878-85); English translation by Blashfield and Hopkins, vol. ii. (New York, 1897); Cartwright, *Mantegna and Francia* (London, 1881); Morelli, *Italian Painters* (London, 1892-93); Woltmann and Woermann, *History of Painting*, vol. ii. (Eng. trans., New York, 1901).

FRANCIA, frän′sē-ȧ, JOSÉ GASPAR RODRIGUEZ (1760?-1840). Dictator of Paraguay. He was born at Asunción, and was the son of a small landed proprietor of Portuguese origin. He was intended by his parents for the Church, and took his degree as Doctor of Divinity at the University of Córdoba de Tucumán, but subsequently adopted the profession of law and gained considerable distinction as a jurist and public official. When the revolution against Spain broke out at Buenos Ayres in 1810, Paraguay at first seemed disinclined to favor the Liberal cause, but finally it joined the movement for liberation and in 1811 proclaimed its independence. Francia took a leading part in the revolution, and was made secretary of the Government Junta. He was the one man of ability among an ignorant population and was so hampered by his colleagues that he resigned his position, only to come forward into still greater prominence when the incapacity of the governing body had precipitated a counter-revolution. In 1813 he was appointed joint consul with General Yegros. The latter was a man of little intellect and energy, and Francia was, in fact, sole ruler from the first. In 1814 he was made dictator for three years, and in 1817 the dictatorship was given him for life. Under Francia's despotic sway, which was at times that of a bloody tyrant, the condition of Paraguay rapidly improved. The extraordinary system of non-intercourse with other nations which he enforced benefited Paraguay in diversifying her industries and forcing her farmers to develop the resources of the soil to the utmost in order to supply the home market. Francia introduced schools, repressed superstitious observances, and enforced strict justice in the courts, but he kept his subjects in a state of cruel bondage and lived in perpetual fear of assassination. Rengger and Longchamp, two Swiss surgeons whom Francia held as prisoners from 1819 to 1825, gave an account of the dictator in their *Essai historique sur la révolution de Paraguay et le gouvernement dictatorial du docteur Francia* (Paris, 1827). Consult also the works of J. P. and W. P. Robertson: *Letters on Paraguay* (London, 1838); *Francia's Reign of Terror* (London, 1839); *Letters on South America* (London, 1843).

FRANCIABIGIO, frän′chȧ-bē̇′jō̇ (an abbreviation of Francesco di Christofano Bigi (1482-1525). A Florentine painter, of the High Renaissance. He was a pupil of Albertinelli (q.v.), but was influenced to a far greater extent by Andrea del Sarto, with whom he lived and worked. Among the works of his early period, showing the influence of Albertinelli, are the "Virgin with Job and Saint John," and "Calumny," after Lucian's description of a picture by Apelles, both in the Uffizi (Florence); the "Madonna del Pozzo," in the same gallery, usually ascribed to Raphael, has also been attributed to him. He assisted Andrea del Sarto in most of his frescoes. Among their joint works was a series representing the "Life of the Virgin," in the Convent of the Servites, Florence. One of this series, the "Marriage of the Virgin," is Franciabigio's best work, although mutilated by the artist himself, who was enraged at its premature unveiling by the friars. Of the series of frescoes of the "Life of John the Baptist," in the Convent dello Scalzo, he executed two: "Departure of John for the Desert," and "Meeting of John and Jesus." Among his other canvases are the "Temple of Hercules," in the Uffizi, and the "Story of Bathsheba" (1523), at Dresden. They are of marked individuality and fine color, and excellently modeled. The best known are portraits of young men. There is a fine specimen in the Pitti Palace, and another, perhaps of himself, in the Palazzo Capponi, Florence. Others are in the Berlin Museum (1552) and the National Gallery, London; the one at Windsor Castle is usually ascribed to Andrea del Sarto.

FRANCILLON, fräɴ′sē̇′yôɴ′. The title of a play by the younger Dumas. It belongs to the most lively and rapid of his comedies.

FRAN′CILLON, ROBERT EDWARD (1841—). An English journalist and novelist. He was born at Gloucester, England, March 25, 1841, was educated at Trinity Hall, Cambridge, and was admitted to the bar in 1864. From 1872 to 1894 he was on the staff of the London *Globe*. His first novel, *Grace Owen's Engagement*, appeared in *Blackwood's Magazine* in 1868. Among his many other novels are *Olympia* (1874), and *A Dog and His Shadow* (1876). He has also written songs and poems.

FRAN'CIS. (1) A friar in Shakespeare's *Much Ado About Nothing.* (2) A 'drawer' at the Boar's Head Tavern, Eastcheap, in Shakespeare's *Henry IV., Part I.*, whom Prince Hal and Poins plague by both calling him at the same time "till his tale was nothing but—Anon."

FRANCIS I. (1708-65). Holy Roman Emperor from 1745 to 1765. He was the son of Leopold, Duke of Lorraine, and in 1729 succeeded his father in the duchy. In 1735 he ceded Lorraine to Stanislaus Leszczynski, father-in-law of Louis XV., to revert after his death to the Crown of France, obtaining in return the succession to the Grand Duchy of Tuscany, whose native rulers, the Medicean family, were about to die out. In 1736 he married Maria Theresa of Austria, the only daughter and heiress of the Emperor Charles VI., and in the following year became Grand Duke of Tuscany. In 1740 Charles VI. died, and Maria Theresa succeeded him as ruler of the Austrian possessions. She made her husband co-regent with herself, but gave him little share in the administration. In the wars carried on against Frederick the Great Francis took little personal share. In 1745 he was elected Holy Roman Emperor and was crowned at Frankfort, October 4th. The Famous Seven Years' War (1756-63) now broke out between Austria and Prussia, but the cares which it imposed fell mainly upon the great-hearted Maria Theresa, while Francis chiefly concerned himself with amassing a huge private fortune. He died August 18, 1765, at Innsbruck. His son Joseph succeeded him in the Imperial dignity, but Maria Theresa retained in her hands the sovereignty of the Austrian dominions till her death (1780). Consult: Seyfart, *Leben Franz' I.* (Nuremberg, 1766); Arneth, *Geschichte Maria Theresias* (Vienna, 1863-79).

FRANCIS II. (1768-1835). Holy Roman Emperor from 1792 to 1806, and ruler of the Austrian dominions from 1792 to 1835 (with the title of Emperor of Austria from 1804). He was the eldest son of the Emperor Leopold II., and of Maria Louisa, daughter of Charles III., King of Spain, and was born at Florence, February 12, 1768. In 1790 his father, previously Grand Duke of Tuscany, became Emperor on the death of his brother Joseph, and on his death, March 1, 1792, was succeeded in the hereditary Austrian dominions by Francis, who, in July, was elected to the Imperial throne of Germany. His reign began at a time when the progress of the French Revolution was exciting the alarm of the Old European dynasties. Austria was in alliance with Prussia against the Republic, and the allied armies invaded France, but were driven back. In 1794 the French arms carried all before them in Belgium. In 1795-96 the war between France and Austria raged fiercely on German soil. In 1796 Bonaparte swept through northern Italy and in 1797 Austria was invaded. Francis was forced to conclude the Treaty of Campo Formio October 17, 1797, by which Austria surrendered Belgium and Lombardy, receiving in return most of the dominions of the extinguished Republic of Venice. Two years afterwards Francis, in alliance with Russia and England, again took up arms, and was at first successful; but the recall of the Russian general, Suvaroff, and the return of Bonaparte from the East turned the tide. The victories won by Bonaparte at Marengo and by Moreau at Hohenlinden broke the power of Austria, and Francis was compelled to sue for peace. By the Treaty of Lunéville in 1801, France was confirmed in the possession of the left bank of the Rhine. In 1804 Francis assumed the title of Emperor of Austria. In 1805 he entered into a new alliance with Russia; but the contest with France ended more disastrously than ever for the Austrians. The French victory at Austerlitz completely humiliated Francis, who, at the Peace of Pressburg, in December, 1805, was obliged to surrender the Venetian territories and Tyrol. The Holy Roman Empire was now dissolved, after lasting for a thousand years, and Francis was henceforth known as Emperor of Austria and King of Bohemia and Hungary. In 1809 he recommenced the war with Napoleon. The battle of Aspern or Essling was an Austrian victory, though not a decisive one, but Napoleon triumphed again at Wagram, and dictated terms of peace from the Palace of Schönbrunn in October of the same year, wresting from the Hapsburgs a large portion of their ancient hereditary territories, out of which the conqueror created the dominion of the Illyrian Provinces. In 1810 the French Emperor married the daughter of Francis, Maria Louisa. A permanent friendly alliance now seemed to be concluded between the two empires; and during the Russian campaign of 1812 the Austrians rendered the French some slight assistance. After the destruction of the French army of invasion in Russia, Francis, who had exerted himself fruitlessly to mediate between France and Russia, suddenly joined the allies, helped to win the battle of Leipzig, and with the Russians and Prussians advanced to Paris in 1814. Immediately after the first abdication of Napoleon the Congress of Vienna was assembled for the reconstruction of the political system of Europe. (See Austria-Hungary.) Francis joined Alexander I. of Russia and Frederick William III. of Prussia in the formation of the Holy Alliance (q.v.), and the reactionary and absolutistic ideas embodied in that contract characterized the policy during the remainder of his reign. Its guiding spirit and his constant counselor was Metternich (q.v.). Francis died on March 2, 1835. Consult Meynert, *Franz I.* (Vienna, 1871-73).

FRANCIS I. (1494-1547). King of France 1515 to 1547. He was the son of Charles, Count of Angoulême, and was born at Cognac, September 12, 1494. In his youth he received a thorough military training consistent with his rank and position. At the age of twenty he married Claude, daughter of Louis XII., and succeeded his father-in-law January 1, 1515. He immediately entered upon the task of reconquering Milan, which had been wrested from his predecessor two years before. At the head of 40,000 men Francis crossed the Alps and attacked the Swiss allies of the Milanese at Marignano, completely defeating them with a loss of 12,000 men, September 13 and 14, 1515. On the field of battle Francis accepted knighthood from the renowned Bayard. After some further successes he returned to Paris in 1516. On the death of the German Emperor Maximilian in January, 1519, Francis I. and Charles of Spain became rival candidates for the Imperial crown. The election of Charles excited the anger of the French King, who immediately prepared for war, and endeavored to secure the alliance of Henry VIII. of England, but with no success, Henry instead forming an alliance with the Pope and the Emperor against Francis. The forces of Francis I. were driven out of Italy; the English and Imperialists invaded France; the Constable de Bourbon, who was discovered to be conspiring against his sovereign, fled to Charles, who gladly accepted his services. An attempted invasion of Italy by the French failed, and the Imperialists advanced into Provence. On the approach of the French King they withdrew into Italy, where they were followed by Francis, who overran Lombardy, but was totally defeated and taken prisoner at the battle of Pavia, February 24, 1525. Charles carried his captive to Madrid, and only granted him his liberty on the hardest conditions. He was forced to renounce the sovereignty of Flanders and Artois, the Duchy of Burgundy, and all his Italian possessions; to promise the restoration of the Constable de Bourbon to his former dignities; and to surrender his two sons as hostages. Francis obtained his freedom March 17, 1526; but his first act, on his return to his dominions, was a refusal to fulfill the pledges he had given. Pope Clement VII. absolved him from his oath; England, Rome, Venice, Florence, and Genoa—all of whom were growing alarmed at the immense power of Charles—withdrew from the Imperial alliance and sided with his antagonist. The war in Italy now recommenced. On May 6, 1527, the Imperial forces of the Constable de Bourbon stormed and sacked Rome and captured the Pope. A French army under Lautrec was sent into Naples, but after a series of brilliant successes was almost wholly cut off by disease. About the same time Francis sent a challenge to Charles to decide their quarrel by single combat. The challenge was accepted, but the duel never took place. Peace was concluded at Cambrai in August, 1529, to the great advantage of the Spaniards. In 1536, however, war broke out again between the French and the Emperor, the French having overrun Savoy, to which Francis laid claim, and whose Duke was the ally of Charles V. Little definite result ensued, but the war was marked by an alliance between Francis and the Turks. Finally, by the efforts of Pope Paul III., a truce was concluded for ten years at Nice, between Charles and Francis, June 18, 1538. In point of fact, however, peace lasted only four years, and in 1542 the French King put into the field five different armies against the Emperor, who had just been repulsed by the Moors of Algiers. The battle of Ceresole, April 14, 1544, in which the French were completely victorious, partially wiped out the dishonor of the defeat at Pavia, but a second alliance with the Turks renewed the indignation of the Christian powers. Charles V. and Henry VIII. of England marched upon Paris, and Francis was compelled to make peace with the Emperor at Crespy, September 18, 1544. The war with England continued till 1546. Francis died at Rambouillet, March 31, 1547. Gay and voluptuous, Francis was still capable of heroic impulses and acts of splendid generosity. He was a generous patron of the artists of the Renaissance, several of whom were to be found at the French Court. Libraries, schools, and colleges were founded and learning encouraged. His persecution of the Vaudois and other Protestant sects, however, has left a dark stain on his memory.

Bibliography. Consult the general histories of Michelet, Martin, and Ranke, all of which give a good account of the reign of Francis I. There is no good single work on his reign, the most complete, Gaillard, *Histoire de François I.* (Paris, 1769), being out of date. Of existing works in French the best are: Paris, *Etudes sur François Ier* (Paris, 1885), a work dealing largely with the social life of the times; Mignet, *Rivalité de François Ier et Charles Quint* (Paris, 1876); Capefigue, *François Ier et la renaissance* (Paris, 1844). In English a popular account will be found in Pardoe, *The Court and Reign of Francis I.* (London, 1849, and later editions); Cochrane, *Francis I. and Other Historic Studies* (London, 1870); Coignet, *Francis I. and His Times*, translated by Twemlow (London, 1889).

FRANCIS II. (1544-60). King of France from 1559 to 1560. He was the eldest son of Henry II. and Catharine de' Medici, and ascended the throne in his sixteenth year. Weak in mind and body, he was merely a tool in the hands of the Duke of Guise and the Cardinal of Lorraine, whose ambition brought on the disastrous civil wars. But for his marriage (1558) with Mary Stuart, a niece of the powerful Guises, Francis II. would now scarcely be remembered. Consult De la Barre-Duparcq, *Histoire de François II.* (Paris, 1867).

FRANCIS I. (1777-1830). King of the Two Sicilies from 1825 to 1830. He was the son of Ferdinand I. and became heir to the throne in 1778. In 1812 he was appointed Regent of Sicily by his father, and proclaimed a constitutional government, but in the following year his father deposed him, and dissolved the Parliament. In 1816 Francis became Governor of Sicily, and in 1820 Regent of Naples. In 1825, on the death of his father, he ascended the throne. The character of liberal ruler which he had previously assumed immediately disappeared; and his reign was marked by corruption, cruelty, and subserviency to Austria. Consult Nisco, *Napoli sotto Francesco I.* (Naples, 1887).

FRANCIS II. (1836-94). King of the Two Sicilies from 1859 to 1861. He was the son of Ferdinand II., and followed his father's system in ruling with an iron hand. He was completely under the influence of the Jesuits, and refused all liberal concessions in spite of the urgent demands of the powers. When all Sicily, with the exception of Messina, had submitted to Garibaldi, in the summer of 1860, he sought to pacify his people by the promise of manifold reforms, and failing to secure their good will, made strong but unsuccessful efforts to secure foreign intervention in his behalf. After Garibaldi's entrance into Naples September, 1860, the King fled to Capua, and thence to the citadel at Gaeta. After a short siege, Gaeta surrendered, and the King took refuge on a French frigate February 13, 1861. His dominions were incorporated in the Kingdom of

Italy, and he selected Rome as his place of residence. Consult Nisco, *Francesco II., re.* (Naples, 1891). See GARIBALDI; ITALY.

FRANCIS JOSEPH I. (1830—). Emperor of Austria. He was born August 18, 1830, at Vienna, the eldest son of Archduke Francis and a nephew of Ferdinand I., Emperor from 1835 to 1848. Francis was taught the various languages of the heterogeneous Austrian monarchy. In 1848 he served under Radetzky in Italy. On December 2, 1848, amid the convulsions which threatened the dissolution of the Empire, the weak Emperor Ferdinand abdicated, his brother, the Archduke Francis, gave up his claims to the crown, and Francis Joseph, whose youth and popularity it was believed would make it easier to harmonize the conflicting interests of the monarchy, mounted the Austrian throne. Hungary was now in a state of open revolt, and in April, 1849, declared itself a republic with Kossuth as Governor. In Italy Charles Albert of Sardinia again took up arms against Austria. Both in Hungary and Italy Austria triumphed, and the Emperor devoted himself to the reëstablishment of his authority. (See AUSTRIA-HUNGARY.) In 1853 an attempt on his life was made by an Hungarian, but the Emperor escaped with a slight wound. The progress of reaction, to which the Empire now seemed committed, was signalized in 1855 by the conclusion of a concordat with the Pope, by which extraordinary privileges were conferred on the Roman Catholic Church. In 1859 Francis Joseph was called to face a war with France and Sardinia, which ended with the loss of Lombardy. After this war Francis Joseph abandoned the policy of reaction, and began the necessary work of reform, and after the disastrous Seven Weeks' War (q.v.) with Prussia, a reconstruction of the monarchy on a dualistic basis was effected by the *Ausgleich* of 1867. The abrogation in 1870 of the concordat of 1855 antagonized the Pope. Francis Joseph has since striven to maintain a constitutional and parliamentary régime in his dominions. He enjoys the respect and affection of his subjects, and it is his personal influence that really holds his dominions together under the most discouraging political conditions. During his reign the Austro-Hungarian monarchy has experienced a great industrial development. Francis Joseph married, April 24, 1854, Elizabeth, daughter of Duke Maximilian of Bavaria, who was assassinated by an Italian anarchist in Geneva September 10, 1898. The Emperor's only son, Rudolph, died a violent death in January, 1889. The present heir presumptive is the nephew of Francis Joseph, Francis Ferdinand. See AUSTRIA-HUNGARY.

FRANCIS, CONVERS (1795-1863). An American Unitarian clergyman and writer. He was born at West Cambridge, Mass., graduated at Harvard, and became a Unitarian minister at Watertown. Lydia Maria Child, the philanthropist, was his sister. Dr. Francis was made professor of pulpit eloquence in Harvard University. He wrote a *Life of Rev. John Eliot, the Apostle to the Indians* (1836), for Sparks's "Library of American Biography," and a *Life of Sebastian Rale* (1848), the Jesuit missionary, as well as memoirs of other celebrated men. Consult Newell, "Memoirs of Convers Francis," in *Massachusetts Historical Society's Proceedings* (Boston, 1864-65).

FRANCIS, JAMES BICHENO (1815-92). An American hydraulic engineer. He was born at Southleigh, England, and came to America at the age of sixteen. From 1837 to 1884 he was chief engineer of locks and canals on the Merrimac River, and in this connection his numerous investigations and experiments in hydraulic engineering have attracted wide attention. His scientific papers have been published chiefly in *Lowell Hydraulic Experiments* (3d ed. 1883), and he also wrote *The Strength of Cast-iron Columns* (1865).

FRANCIS, JOHN WAKEFIELD (1789-1861). An American physician of German and Swiss descent, born in New York. He was graduated from Columbia College in 1809, and received the degree of M.D. from the College of Physicians and Surgeons, New York City, in 1811. He was professor of obstetrics and of medical jurisprudence in Rutgers Medical College, New York City, from 1826 to 1830; professor of materia medica in the College of Physicians and Surgeons from 1813 to 1816; professor of the institutes of medicine from 1816 to 1820; and professor of obstetrics from 1820 to 1826. He was one of the most active members of the New York Historical Society, and used his influence to promote the study of natural history and the fine arts. He interested himself greatly in the Woman's Hospital, the State Inebriate Asylum, and kindred institutions. With Dr. David Hosack he published the *American Medical and Philosophical Register* (1810-14). Among his many works were: *Use of Mercury* (1811); *Cases of Morbid Anatomy* (1814); *Febrile Contagion* (1816); *On Cholera Asphyxia* (1832); *Anatomy of Drunkenness* (1857); *Memoir of Christopher Colles;* and *Old New York, or Reminiscences of the Past Sixty Years.*

FRANCIS, SIR PHILIP (1740-1818). An English epistolary writer, the reputed author of the *Letters of Junius.* The son of Rev. Philip Francis, he was born in Dublin, and was educated at Saint Paul's School, London, where he had for a school-fellow Henry S. Woodfall, afterwards editor and printer of the *Public Advertiser* and publisher of the *Letters of Junius.* In 1756 he obtained a place in the office of Henry Fox, then Secretary of State. In 1758 he became secretary to General Bligh, whom he accompanied on the expedition against Cherbourg; in 1760 secretary to the Earl of Linnoul, Ambassador to Portugal; in 1761 amanuensis to Pitt; and in 1762 first clerk in the War Office. In 1773 he was appointed a member of the Council of Bengal, with a salary of £10,000, and sailed for India the next year. He quarreled with Warren Hastings, by whom he was severely wounded in a duel. Returning to England in 1781, he entered Parliament three years later, and took an active part in the impeachment of Hastings. He never gained a reputation as an orator, but his great abilities and extensive information always commanded the respect and attention of the House. In his political opinions he was a decided and consistent Whig. He withdrew from Parliament in 1807. None of his acknowledged writings, consisting mostly of political pamphlets, are of permanent value. There is considerable evidence to prove that he was the author of the *Letters of Junius* (q.v.). Consult Parkes and Merivale, *Memoirs of Sir Philip Francis* (London, 1867).

FRANCIS′CA. A nun in the convent of which Isabella is a novice in Shakespeare's *Measure for Measure.*

FRANCIS′CANS, ORDER OF (also called Minorites or Lesser Brethren), a religious Order of the Catholic Church, founded by Saint Francis of Assisi in 1209. For an account of the establishment of the Order and its earliest years, see FRANCIS OF ASSISI, SAINT. The rule drawn up by Saint Francis in 1209 was divided into twenty-three chapters, containing twenty-seven precepts, which were afterwards rendered obligatory by the Popes under pain of mortal sin. The use of money is absolutely forbidden, and the quantity, quality, and value of the clothing are prescribed. The habit was to consist of a gray gown of coarse cloth, with a pointed head or capuche, an under-tunic and drawers, and a cord around the waist. This costume resembled the dress of the shepherds of the day. The use of shoes and riding on horseback were prohibited. Conversations with women and the visiting of female monasteries were forbidden. Fasts on all Fridays of the year were enjoined, as also during the periods from All-Saints to Christmas and from Epiphany to Easter. The recitation of the Divine Office was also rendered obligatory. Absolute obedience to superiors in all things not contrary to the rule was prescribed. The Order grew rapidly and spread throughout the various countries of Europe, until at the second general chapter, held at Assisi in 1219, within ten years of its birth, more than five thousand brethren were present. In less than half a century it reckoned some 33 provinces, in which there were over 8000 convents, with a membership of 200,000. Some idea of the extraordinary extension of this remarkable institute may be formed from the startling fact that, in the dreadful plague of the black death in the following century, no fewer than 124,000 Franciscans fell victims to their zeal for the care of the sick and for the spiritual ministration of the dying. After the death of Saint Francis a modification of the rule was introduced by Brother Elias, his successor in the office of general of the Order. This innovation related to the interpretation of the nature and extent of the vow of religious poverty, whether the community could acquire the privilege of the right of property even in things of necessary use. Those who adhered to the letter of the rule denied the privilege of all right of property to the community, and contended that it was unlawful for the Order to acquire or retain a right of property in houses, convents, or even churches, restricting its right in everything which it possessed to the simple use. Out of this controversy arose divisions and subdivisions in the Order. The first broad distinction to which it gave rise was that between the Conventuals and the Observantines, the former living according to a mitigated interpretation of the rule and holding to the community's right of property, while they strictly adhered to the vow of poverty on the part of the individual; the Observantines, following the more rigid interpretation of the rule, deny the right of property in the Order and live more in the manner of hermits, in low, mean dwellings, and according to the original rigor of the institute. The latter are called Friars Minor of the Strict Observance. In the course of time there arose among the Observantines themselves several reform movements, which gave rise to three branches; that of Saint Bernardino of Siena in 1419, called the Reformed; then that of Blessed John de la Puebla, and Blessed John of Guadalupe, under the name of Recollets in 1500; and finally the reform of Saint Peter of Alcantara in 1555, known under the name of Alcantarines. But all three branches are subject to the one minister-general at Rome, and all are discalced or barefooted friars. Several popes attempted to reconcile the differences between the Conventuals and the Observantines without avail. Finally, in 1517, Leo X. officially recognized the distinction between them, and in a bull promulgated that year gave the name of Conventuals to those who persisted in following the mitigated rule and in holding to the community's right of property. Each body had its own general, but the minister-general of the Observantines enjoyed preëminence and authority over the general of the Conventuals, who was obliged to obtain his confirmation from the former. During the Pontificate of Sixtus V. the Conventuals sought in vain to free their head from this subordination, and renewed the attempt in 1594 under Clement VIII. with no greater success. When they renewed their claim again under Urban VIII. the latter imposed silence upon them by a brief of April 21, 1631.

The entire Franciscan body consists of three main groups, respectively called the first, second, and third Orders. To the first Order belong the male members of the different observances, who bind themselves by solemn vows; the second Order consists of the female religious, the Poor Clares, Urbanists, and Capuchin nuns; the tertiaries, or third Order, comprise both lay persons and certain religious congregations affiliated to the Order of Franciscans. (See TERTIARY.) An immense number of persons desirous of practicing in the world the virtues of the cloister joined the third Order, from the humblest to the highest station in life; notably among the latter in the thirteenth century were Saint Louis of France and Saint Elizabeth of Hungary. In the course of time some tertiaries desirous of living in community, while conforming to the rules of the third Order, formed communities in many parts of Europe which were affiliated with the general body as a branch distinct from the first and second Orders.

The head of the entire Franciscan body is chosen alternately from the Cismontane and the Ultramontane families, a geographical division, the latter being those religious whose convents are situated in France, Spain, Lower Germany, Saxony, the islands of the Mediterranean, Africa, Asia, and the Indies in general; the former those in Italy, Upper Germany, Hungary, Poland, Syria, and Palestine. Each family is again divided into provinces, vicariates, or custodies. Several custodies constitute a province under a common superior appointed by the general. Some custodies are subject to a provincial, while others depend immediately upon the general. The superior of the entire Order bears the title of Minister-General of the Order of Saint Francis, and to his jurisdiction the Poor Clares and the Urbanist nuns are also subject. The general of the Conventuals is called Master-General of the Friars Minor Conventuals; the general of the Capuchins, an offshoot of the Franciscans, founded by Matteo di Bassi in 1526, is called Minister-

General of the Friars Minor Capuchins. The third Order has also a general of its own. The Order has given five Popes to the Church: Nicholas IV., Alexander V., Sixtus II., Sixtus V., and Clement XIV., besides fifty-four cardinals, beginning with Saint Bonaventure. It has given some celebrated theologians and philosophers to the ranks of the schoolmen; Saint Bonaventure, Duns Scotus, Alexander of Hales, William of Ockham. Roger Bacon, famous as the experimental philosopher of the Middle Ages, was a Franciscan friar. The great Spanish statesman Cardinal Ximenes, two centuries later was also a follower of Saint Francis. Its historian, Father Luke Wadding, who published his elaborate *Annals* of the Order in the seventeenth century, bears a deservedly high reputation. In lighter literature, and especially poetry, Saint Francis himself is notable as a sacred poet. Jacapone da Todi, the author of the "Stabat Mater," is one of the most celebrated mediæval hymn-writers; Lope de Vega, the Spanish dramatist, closed his eventful career as a member of the third Order. Dante, it is believed from a passage in the *Divina Commedia*, was a Franciscan tertiary. In the revival of art the Franciscan Order bore an active and enlightened part. They may be said to have been the inspiring influence which gave rise in painting to the mystical School of Umbria, which in Perugino and Raphael attained the ultimate reach of Christian art. Giotto and his successors, especially in fresco painting, were profoundly influenced by the Franciscan spirit. In architecture the same spirit was potent in creating new types of churches in line with Cistercian models. The Franciscans may be said to have imported into art a sentiment which, before them, had existed only in a crude state—seraphic love. Their idealism and religious fervor did more perhaps than any other factor to exalt and spiritualize the art of the Middle Ages up to the time of the Renaissance.

Bibliography. Lucas Wadding, *Annales Minorum Fratrum* (25 vols., Rome, 1731-1887, going down to 1622); MacDonell, *Sons of Francis* (London, 1902); the general histories, Kolde, *Die kirchlichen Bruderschaften und das religiöse Leben im modernen Katholicismus* (Erlangen, 1895); Heimbucher, *Die Orden und Kongregationen der Katholischen Kirche* (Paderborn, 1896-97); the special histories in England, J. S. Brewer, *Monumenta Franciscana* (London, 1858-82); Mrs. Anna Hope, *Franciscan Martyrs in England* (London, 1898); Father Thaddeus, *Franciscans in England, 1660-1850* (London, 1898); in Ireland, C. P. Meehan, *Rise and Fall of Irish Franciscan Monasteries and Memoirs of the Irish Hierarchy in the Seventeenth Century* (6th ed., Dublin, 1891). On the tertiaries, consult: Léon, *Le tiers ordre séraphique d'après la constitution 'Misericors Dei Filius' de S.S. Leon XIII.* (Bordeaux, 1884); Gerard, *Documents pour expliquer la règle du tiers ordre de Saint François de Assisi* (3 vols., Paris, 1899).

FRANCIS DE SALES, *Fr. pron.* fräN'sēs' de säl, Saint (1567-1622). A distinguished saint and writer of the Catholic Church. He was of noble descent, and was born at the Château de Sales, the seat of his family in Savoy. He was the eldest son, and his father bestowed unusual care upon his education with the idea of fitting him for a worldly career in keeping with his station in life. After spending his earlier years at the Collège de la Roche and the College of Annecy, in the neighborhood of his home, he became a pupil, at thirteen years of age, of the Collège Clermont at Paris under the direction of the Jesuit Fathers. In 1584 he entered the University of Padua, where, at twenty-four, he took his final degree with great distinction and became a Doctor of Laws. But his inclination was for the Church rather than for law. His father at first opposed his wish to enter the priesthood, but in the end gave his consent. Upon his ordination he was appointed provost of the diocesan chapter at the request of Monseigneur de Granier, Bishop of Geneva. In 1594 the young priest was sent to the difficult mission of the Chablais, a province of Savoy, which had become Calvinistic. His efforts for a long time proved fruitless; but in time he saw his labors repaid with numerous conversions, before his departure witnessing the restitution of all churches and of all ecclesiastical property in the Chablais to the diocesan clergy. Shortly after his return from the apostolate of the Chablais, at the solicitation of Monseigneur de Granier, Francis was made coadjutor bishop with the right of succession to the See of Geneva; and his succession followed in 1602. In that year the interests of the French division of the Geneva diocese took Francis to Paris. Here Henry IV. conceived a cordial liking for him. As Bishop of Geneva Francis was as indefatigable in his apostolic labors as when he was a simple priest. His preaching was simple, fervid, and direct. He carefully avoided the turgid ornament and rhetorical affectations common to the sermons of his century. As a writer Saint Francis de Sales has attained a wide popularity. His *Introduction to the Devout Life* has been translated into almost every language of Europe, and has been more widely read than any other work on devotion with the exception of the *Imitation of Christ*. His *Treatise on the Love of God* is his chief doctrinal work, and shows more fully the comprehensive character of his mind. His style is simple, lucid, and profusely illustrated. It was under the spiritual direction of Saint Francis de Sales that Sainte Jeanne de Chantal (see Chantal, Jeanne Françoise de) founded the Congregation of the Visitation of the Virgin Mary in 1610. Saint Francis died at Lyons, on September 28, 1622. In 1665 he was solemnly canonized by Pope Alexander VII., and in 1877 he was declared one of the Doctors of the Church. His complete works were published in Paris, 1861-62. The *Love of God* has been edited by Strowsky (Paris, 1901; Eng. trans., London, 1902). For his life, consult: C. A. de Sales (Chambéry, 1860); Camus (London, 1880); Lear (London, 1882); also Guillot, *François de Sales et les protestants* (Geneva, 1873).

FRAN'CIS OF ASSISI, äs-sē'zē, Saint (1182-1226). The founder of the Order of the Friars Minor, or Franciscans. He was born in the little town of Assisi, Italy. His father was a rich merchant by the name of Pietro Bernardone; his mother, Pica, of the noble family of the Bourlemonts of Provence, a woman of piety and character. The child's baptismal name was Giovanni (John); but his father, out of his predilection for France, with which he carried on an extensive trade, gave the boy the surname of Francesco (the Frenchman), which history has consecrated. Francis was taken into business partnership at the age of fourteen by his father. In his twenty-fourth year, after much meditation and pondering on the course of life he had been leading, he suddenly abandoned his old friends and haunts, and embraced a life of rigid penance and utter poverty. His object was to lead a life as nearly modeled upon that of Christ as possible, and by absolute renunciation of the world to attain evangelical perfection. Retiring to a grotto near Assisi, he gave himself up to penance and profound meditation on the sufferings of Christ. His austerities and his simple eloquence attracted attention, and it was not long before others, awakened by his ardent example, sought to follow in his steps and join themselves to him in his austere mode of life. His first companions were fellow townsmen, Bernard of Quintavalle, a rich and noble layman, and Peter of Catana, a canon of the cathedral. Here was the nucleus of the Franciscan Order. It was not the intention of Saint Francis in the beginning to found a new Order. But others associating themselves with the three companions, until there were twelve all told in the band, and asking for a rule of life, Saint Francis drew up a rule in twenty-three chapters, which, besides the three ordinary vows, of poverty, obedience, and chastity, prescribed the express and absolute renunciation of every possession and the engagement to live upon alms. As soon as the rule was drawn up (probably toward the close of June, or early in July, 1209), all betook themselves to Rome to seek the approval of the Pope. Innocent III., then Pope, after some hesitation, approved the rule by word of mouth, made Francis superior-general of the Friars Minor, and conferred the diaconate on the founder, for Francis was as yet only a layman, and always, from motives of humility, refused to become a priest. On their return to Assisi the Friars Minor established themselves in a little house adjoining the Chapel of Saint Mary of the Angels. During the following two years the brethren occupied themselves with preaching and exhorting the people throughout the rural district around Assisi. The Order now grew rapidly, and in 1216 was solemnly approved by Innocent III. Francis now sent missionary bands into the different provinces of Italy; then into France, Spain, and even Africa, to preach to the Moors. He himself set the example of the missionary work of the Order by going into the East. Two years before his death Saint Francis, while in an ecstasy of prayer, is said to have received the marks (stigmata) of the wounds of Jesus upon his own person. (See STIGMATIZATION.) The scene of this event is laid on Monte Alverno, a lonely mountain near Assisi, and the date September 14, 1224. Saint Francis died at Assisi, October 3, 1226. He was canonized by Pope Gregory IX., in 1228.

The works of Saint Francis have been frequently printed, by Horoy (Paris, 1880), in Latin; better by B. da Fivizzano (Florence, 1880), Latin with Italian translation. Consult the biographies written by Paul Sabatier (Paris, 1894; Eng. trans. by Houghton, New York, 1894); Prudenzano (Naples, 1896); Knox-Little (London, 1897); Oesterly (London, 1901); and Christen (Innsbruck, 1902). Consult also: Brother Leo of Assisi, *Saint Francis of Assisi, the Mirror of Perfection,* edited by Paul Sabatier, translated by Sebastian Evans (London, 1899); Duff Gordon, *The Story of Assisi* (London, 1901); *Acta Beati Francisci et Sociorum Ejus* (Saint Louis, 1902), edited by Sabatier; Barine, *S. François d'Assise et la légende de ses trois compagnons* (Paris, 1901); Carmichael, *The Lady of Poverty: A Thirteenth Century Allegory* (New York, 1902).

FRANCIS OF PAOLA, pou′lȧ, SAINT (1416-1507). Founder of the Order of Minimites. He was born in Calabria. At an early age he gave himself to a hermit's life, following the example of Saint Francis of Assisi, having no bed but bare rocks, and no other food than the herbs which he gathered in the neighboring woods, or which were brought to him by his friends. He was joined by some other enthusiasts, and the building of a chapel in 1436 is generally considered as marking the beginning of the Minimite Order. (See MINIMITES.) In 1474 the Order was definitely confirmed by the Pope, and Francis appointed its first superior. During the following years several new convents were founded in Calabria and Sicily, and the fame of Francis for sanctity and miraculous powers increased daily. When Louis XI. of France was alarmed by the approach of death, he sent to beg the intercession of Francis, who was unwilling to go to France until he was commanded by Sixtus IV. He visited the King at Plessis-les-Tours and prepared him for death, holding him in his arms when it came. Louis's son, Charles VIII., also had a great respect for him, and built him a cloister in the park of Plessis and another at Amboise. He completed his rule in 1493, in three parts, for the brothers, sisters, and tertiaries. He died at the Convent of Plessis in 1507, and was canonized by Leo X. in 1519.

FRANCIS XAVIER, SAINT (1506-52). A celebrated Jesuit missionary, called, from the scene of his mission labors, 'the Apostle of the Indies.' He was the youngest son of one of the most distinguished families of Navarre, and was born near Pamplona, in that kingdom, April 7, 1506. His early education was received at home, and in 1524 he was sent to the College of Saint Barbe, in Paris, where he pursued studies in philosophy with so much distinction that at the age of twenty-four he became a lecturer in philosophy in the Collège Beauvais, at that time one of the most important in the university. He attracted the attention of Ignatius Loyola, then an obscure student at the university, but already taken with the prospect of founding the Society of Jesus. Ignatius, on the lookout for suitable associates, became a close friend of Xavier's. The young professor's mind was intent on university distinction; but, realizing the vanity of his ambitions, he became one of the first members of the Order that his Spanish compatriot was about to found. During Xavier's work in Rome, John III. of Portugal, anxious to extend the influence of Christianity to his immense Indian possessions, made a formal demand of the Pope for missionaries, and asked especially for members of the new Order. Ignatius selected Bobadilla; but illness prevented his setting out, so Xavier was substituted for him, and after a single day for preparation began his journey to Lisbon. At Lisbon, during the preparations for the voyage, he accomplished so much good that the King wanted to retain him at his capital. But Xavier's heart was now bound up in the mission to India, and he sailed from Lisbon, April 7, 1541. He wintered at Mozambique, and did not arrive in Goa until May 6, 1542.

He found the lives of the European Christians in India so scandalous that it was useless to preach to the natives with such a perverse example under their eyes. Accordingly, he first took up the reformation of the foreign townspeople, and succeeded in awakening a spirit of exemplary penance and religious fervor. Then he began his labors among the natives by preaching among the pearl-fishing population of the coast from Comorin to the island of Manar. After a little more than a year he returned to Goa, whence, with a fresh staff of assistants, he visited the Kingdom of Travancore. In the space of a single month here he baptized ten thousand natives. Thence he passed to Malacca, where three other Jesuit missionaries, sent by Ignatius in compliance with Xavier's earnest solicitations, joined him. His success among the dwellers on the coast region proved so encouraging that in 1546 he proceeded to the Banda Islands, to Amboyna, and the Moluccas. Having effected an establishment of the Gospel in many places, he now retraced his steps and revisited the scenes of his missionary labors. His care in the selection and instruction of native catechists was proved by the excellent state of the missions. He had a supreme faculty for organization; hence he succeeded not only in making large numbers of converts, but in forming them into communities with inherent vitality.

After this he crossed to the island of Ceylon, where he converted the King of Kandy, with many of his people. In May, 1548, he returned to Goa, to prepare for the conversion of the Japanese Empire. A distinguished Japanese convert became a valuable auxiliary, and by his aid Xavier was enabled to acquire enough of the Japanese language to translate and explain the Apostles' Creed in it. His first success was insignificant, but before long the usual blessing attended his labors. The mission founded by him at Miako continued to flourish for more than a hundred years, until the final expulsion of Christianity from the Japanese Empire. After two years and a half in Japan, he resolved to organize a mission to China. At Malacca he tried to arrange with the Governor that an embassy should be sent in the name of the King of Portugal to China, by the help of which he hoped to gain an entrance for his mission. He was not able to effect this, however. Accordingly, he took passage in a merchant ship to the island of Sancian, near Macao, which was at that time the trading port of the Chinese with merchants from Portugal. Here, having obtained a Chinese interpreter, he hoped to induce some native merchants to land him secretly on the coast. His plan was baffled by the fears of the Portuguese, who dreaded that the Chinese authorities would punish this infraction of the law.

Xavier's disappointment was keen. For years his heroic zeal had tempted him to labors beyond his strength, and his sublime charity had exposed him to privations which had undermined his constitution. He fell ill of fever, for which his attendants could find no means of relief. On the very threshold of what he looked forward to as the greatest opportunity of his missionary life, the saint passed away, on the island of Sancian, according to his latest biographer, November 27, 1552, though the date December 2d has always been given hitherto. Many miracles performed by him at all stages of his career as a Jesuit are attested by numerous witnesses. Xavier was beatified by Pope Paul V., in 1619, and canonized by Pope Gregory XV., in 1622. His feast day was fixed upon December 3d. His only literary remains are a catechism, some short ascetic treatises, and a collection of letters. Of the letters there are translations in most of the modern languages.

Consult: Coleridge, *Life and Letters of Saint Francis Xavier* (London, 1873); Cros, *Saint François de Xavier, sa vie, son pays, sa famille* (Toulouse, 1900-01); *Monumenta Xaveriana* (Madrid, 1899-1900).

FRANCK, fräɴk, Adolphe (1809-93). A French philosopher, born at Liocourt, Meurthe, of Jewish parents. He was professor of philosophy in various French schools, and occupied the same position at the Collège Charlemagne in Paris in 1840. He held the chair of Greek and Latin philosophy at the Collège de France from 1849 to 1852, and from 1854 to 1881 lectured there on natural law and the law of nations. He was one of the editors of the *Journal des Débats*, and the founder of *La Paix Sociale*, the organ of the league against atheism. Among his works are: *Dictionnaire des sciences philosophiques* (1843-56), of which he edited the greater part; *Le communisme jugé par l'histoire* (1849); *Philosophie et religion* (1867); and *La religion et la science dans le judaïsme* (1883).

FRANCK, César Auguste Jean Guillaume Hubert (1822-90). A French composer, born at Liège. After studying at the conservatory there he went to Paris, where he attended the Conservatory, studying under the organist Benoist and others. He settled in Paris, and in 1872, at the Conservatory, succeeded Benoist, who retired after fifty years of service. Meanwhile Franck had composed much, but found little recognition, though it is interesting, as indicating Liszt's breadth of judgment, that in the fifties chamber-music by Franck was played in Liszt's private concerts at Weimar. In 1846 Franck's oratorio *Ruth* was brought out at the Conservatory, but without success. Yet twenty-five years later it was revived at the Circe d'été, and the following year at the Conservatory, with such brilliant results that a 'Franck cult' was instituted among the younger French musicians. Franck's music, however, though admirable technically, lacks melodic spontaneity. While France at one time neglected his talent, the present tendency there is to overrate it. In the United States his best-known works are his oratorio; *Les béatitudes;* chamber music; songs; and his *Variations symphoniques*, for piano and orchestra. He died in Paris.

FRANCK, fräṉk, Melchior (c.1580-1639). A German composer, born at Zittau. He lived in Augsburg, where his first works were published in 1601. The following year he went to Nuremberg, and in 1603 became chapel-master at Coburg. His best work is in sacred music, and some of his chorals are still sung. He is one of the most prolific and interesting of the old German composers.

FRANCK, Sebastian (1499-1543). A German reformer and humorist, born at Donauwörth. Ordained to the Roman priesthood in 1524, he joined the Reformation shortly afterwards; married in 1528, and, after some minor didactic works, published at Strassburg in 1531 his *Chronika,* one of the first German attempts at universal history. He led a wandering and precarious life as a soap-boiler, author, and printer, and in 1539 settled at Basel, where he died. He appears to have been a pantheistic mystic, a forerunner of modern German idealism, of wide social sympathies and broad tolerance. His style is vigorous and clear—far superior to that of his time. His collection of *Sprichwörter* (1541) is edited by Guttenstein (1831). For his life, consult: Weinkauff, in Birlinger's *Alemannia* (Bonn, 1877), and Haggenmacher (Zurich, 1886).

FRANCKE, fränk'e, August Hermann (1663-1727). A distinguished German educator and philanthropist, founder of the Francke Institute (*Stiftungen*) at Halle. He was born at Lübeck. In the early years of his manhood his interests were primarily theological. His orthodoxy was called into question, however, partly because of the envy caused by his extraordinary popularity as a preacher, and he was therefore unable to hold his position as lecturer at Leipzig. While still a young man, his attention had been drawn to the unsatisfactory state of the German educational methods, and when, in 1695, he was called to assume the duties of pastor in a small town near Halle, he started a private school in his own house. The school grew rapidly, and Francke found it necessary to rent a building to accommodate it. In connection with it he founded a school for the children of well-to-do parents, and in 1697 he added a Latin school and a school for girls. Arrangements were made to care for orphans, and poor scholars received their meals free of charge. A corps of able teachers gathered around him; new buildings were erected; a bookseller's shop and other forms of business were undertaken to help to defray expenses. Francke's theological enemies sought to injure his thriving educational institute: but in 1713 the King of Prussia, Frederick William I., visited it and promised Francke his support. From that time the institute grew unchecked, until at Francke's death the Pedagogium, or school for the children of the wealthy, had 40 students, the Latin school 400, the common schools 1725. One hundred and seventy-five teachers were employed, all of whom were students at the University of Halle. They received their board, and afterwards their lodging, for their services. A seminary for teachers was established as early as 1707, which aimed to train young men in the methods of teaching. Thus the institute became the foremost training school of the time for teachers. The extraordinary success of Francke's Institute led to the establishment of similar institutions in other German cities, and the influence of Francke and his disciples materially affected the character of the Prussian system of public education, which was established by Frederick William I. and remains unchanged in its essential features at the present day.

Francke published a number of pamphlets on religious and pedagogical subjects; but these are of minor importance as compared with his institutional work. Consult: Kramer, *Franckes pädogogische Schriften* (Langensalza, 1885); id., *August Hermann Francke in Lebensbild* (Halle, 1880-82); Stein, *August Hermann Francke in Deutschen Geschichts- und Lebensbilden* (Halle, 1894).

FRANCKE, Kuno (1855—). A German-American scholar and author, born at Kiel. He was educated at the University of Munich, and was appointed professor of German literature at Harvard University, Cambridge, Mass. His publications include: *Zur Geschichte der Schalpoesie des zwölften Jahrhunderts* (1878); *De Hymno in Cererem Homerico* (1880); *Libelli de Lite Imperatorum et Pontificum* (1892); *Social Forces in German Literature* (1896); *Glimpses of Modern German Culture* (1898); and a *History of German Literature* (1901).

FRANCKE, Wilhelm (1803-73). A German jurist. He was born at Lüneburg, and was educated at the Collegium Carolinum, Brunswick, and at Göttingen, where he was appointed professor of Roman law in 1828. In 1831 he was called in the same capacity to Jena, where he also held the position of counselor of the Court of Appeals. During the last thirty years of his life he was associated with the University of Göttingen. He stood in high repute as an authority on and teacher of Roman law, was coeditor of the *Archiv für die civilistische Praxis* (1837-73), and wrote *Das Recht der Noterben und Pflichtteilsberechtigten* (1831).

FRANCKEN, fränk'en. A family of painters of Antwerp, eleven in number, living in the sixteenth and seventeenth centuries. A similarity of Christian names leads to much confusion in classifying their works. When Frans the first found a competitor in Frans the second, he took the name of 'the elder,' the second being 'the younger.' But when the third Frans became a rival of the second, the latter took the name of 'the elder,' and Frans the third became 'the younger.' The eldest of the Franckens, Nicholaes of Herenthals, died in 1596. None of his works is known. Hieronymus (1540-1610), his eldest son, was occupied chiefly in Paris, where he was engaged in decorating the Palace of Fontainebleau, where some of his paintings remain. Others are to be found in the Dresden Museum, the Amsterdam Museum, and the Brunswick Gallery. The second son of Nicholaes was Frans Francken 'the first' (1542-1616). He studied under Floris and was dean of the Guild of Saint Luke in 1588-89. His paintings were mostly religious subjects, and are especially numerous at Brunswick and Dresden. Ambrosius (1544-1618), third son of Nicholaes, left more works than both his brothers. Most of them are religious subjects to be found at Antwerp, in the Church of Saint Jaques and the Museum. Among the best of them are the "Miracle of the Loaves and Fishes," and the "Martyrdom of Saint Crispin," in the Antwerp Museum. His productions are exaggerated in all respects, but he possesses greater invention than the rest. Frans 'the first' trained his sons to the profession. The third of these sons is Frans Francken (1581-1642) 'the second,' who also signed himself 'the younger.' When his son Frans grew up he also signed himself 'the elder.' He studied in Italy, but was also influenced by Rubens. Among his chief works are the "Works of Mercy," in the Antwerp Gallery; "Solon and Crœsus," in the Brussels Gallery; "Christ Washing the Apostles' Feet," in the Berlin Museum. Nearly all European galleries possess his pictures. FRANS FRANCKEN 'the third' (1607-67) painted in the manner of Rubens. He painted religious subjects, of which there are good examples in Antwerp and Augsburg, and interiors of churches, as may be seen at Dresden and The Hague.

FRANCKENSTEIN, fräṉk'*e*n-stīn, GEORG ARBOGAST, Baron (1825-90). A German legislator. He was born at Würzburg, and was educated at Munich. As an Ultramontane member of the Bavarian Diet, he was opposed to the participation of Bavaria in the Franco-German War, and voted against the measure providing for the entrance of the kingdom into the German Empire. In the German Reichstag he became the leader of the Centrist Party. The principal measure introduced by him was the so-called 'Franckenstein Clause,' later incorporated as paragraph 7 of the tariff laws (July 9, 1879). He was first vice-president of the Reichstag from 1879 to 1887.

FRANCO, fräṉ'kō, GIOVANNI BATTISTA (1510-61). An Italian painter and engraver named Semolei. He was born at Udine, went to Rome as a young man, and there was much impressed with the work of Michelangelo. When Charles V. entered the city (1536), Franco painted the triumphal arch with scenes from Roman history. Afterwards he went to Florence and painted in company with Vasari. His drawing is better than his color. By order of the dukes Alexander and Cosimo de' Medici, he executed many portraits and pictures, and for the Duke of Urbino some work in faïence. As an engraver, Franco stands higher than as a painter. He left about a hundred etchings. The best of his works are: "Moses Striking the Rock," "Manna in the Desert," "The Adoration of the Shepherds," and "Simon the Magician." They are rather dryly finished, and have little freedom.

FRANCO-GERMAN WAR OF 1870-71. The immediate cause of this struggle was France's jealousy of the growing importance of Prussia, which power Bismarck was determined to place at the head of a united Germany, and the desire of Napoleon III. to strengthen his tottering throne by a successful war against the hereditary foe of the French nation. The actual occasion for the outbreak of hostilities was furnished by complications growing out of the political situation in Spain. On June 25, 1870, Isabella II. of Spain, who had been deposed in 1868, formally abdicated the throne. On July 5th the foreign governments were notified of her abdication, and on the same day the fact was made public that Prince Leopold of Hohenzollern had consented to become a candidate for the vacant throne of Spain. This consent was said to have the approval of the King of Prussia. The news caused intense excitement in Paris, and the Foreign Minister, the Duc de Grammont, caused representations to be made to the Prussian Government of the displeasure with which the French Government regarded the candidacy of Prince Leopold. On July 12th the announcement of the withdrawal of Prince Leopold's candidature was made. On the following day the French Ambassador, Benedetti (q.v.), unceremoniously addressing William I. at Ems, insisted that the King should make a declaration to the effect that no Hohenzollern prince would ever be permitted to accept the Spanish crown. The King declined to listen to this demand, and broke off the interview. He sent Bismarck a copy of the French demand, with authority to make use of it. This Bismarck did, giving to the press such parts of the communication as would tend to arouse the German people. It does not appear that in so doing he misrepresented the attitude of France. Taking notice of this publication as if it had been official, the French Government, deeming itself called upon to take immediate steps for the defense of the national honor, formally declared war against Prussia, July 19, 1870.

While the popular enthusiasm in the two countries in favor of war was about equal, there proved to be a vast difference as to the state of the military preparations. The French Government supposed that from 450,000 to 500,000 men were available for instant mobilization; but the army was ill organized, imperfectly equipped, and not properly provided with depots. But 250,000 men were ready for the first movements in August, 1870, and there was no reliable reserve. The French force was in one body, practically, known as the Army of the Rhine. Against this the North German Confederation was able to put into the field an army of about 450,000 men with a reserve of nearly 400,000. The French hoped that the South German States, out of jealousy of Prussia, would refuse to join her, but these joined forces at once with their countrymen, put their troops under Prussian command, and thus added to the overwhelming weight that was thrown upon France. The action of Prussia was promptness itself. King William arrived in Berlin July 15th, meeting Bismarck, Moltke, and Roon, and orders for mobilization were at once given. Three armies were formed. The first, under General von Steinmetz, was placed near Trèves, forming the right wing; the second, under Prince Frederick Charles, was sent to Rhenish Palatinate; the third, under the Crown Prince of Prussia, took its position on the frontier of Baden. The French forces were scattered over a line of about 100 miles in length. The First Corps, under Marshal MacMahon, was placed near Strassburg; the Fifth Corps, under Failly, along the frontier of the Palatinate; the Third Corps, under Marshal Bazaine, near Metz; the Second Corps, under Frossard, not far from the Prussian frontier, near Saint Avold; the Fourth Corps, under Ladmirault, near Thionville; the reserve forces, under Bourbaki and Marshal Canrobert, were partly at Nancy and partly at the camp of Châlons; the Seventh Corps, under General Félix Douay, held the fortress of Belfort. These were the positions of the two contending armies toward the end of July, 1870. On the 23d of that month Napoleon appointed the Empress Regent of France, and on the 28th left Paris with the Prince Imperial to take command of the army at Metz. The King of Prussia left Berlin to take his place in the field July 31st, accompanied by General von Moltke, as chief of staff, and Count Bismarck, and on August 2d established his headquarters at Mainz. On the same day a portion of Frossard's corps made an attack on the Prussian position at

Saarbrück, in the presence of the Emperor and his son. After protracted firing the Germans retreated, and the French occupied Saarbrück. The results of this engagement were unimportant.

The first serious conflict of the war took place August 4th, at Weissenburg, where the German advance guard was attacked by the French under Gen. Abel Douay; it ended after a battle of five hours, in the French troops retiring in great disorder, with heavy loss. General Douay was killed. The Germans had now 520,000 men and 1170 guns ready for fighting orders, while the entire force of the French (with reserves) amounted to only 350,000 men. On August 6th at Wörth, the Crown Prince attacked MacMahon, who had been strengthened by divisions of the corps of Failly and Canrobert. The French suffered a terrible defeat, and lost 8000 in dead and wounded, and 6000 prisoners. The German loss was over 10,000 officers and men. On the same day a bloody battle was fought at Spichern, near Saarbrück, also known as the battle of Forbach, between General Steinmetz and General Frossard. The Germans stormed the heights of Spichern, and the French force was thrown back in disorder on Forbach and Metz. The Germans lost 4648 men in killed and wounded, while the French loss amounted to about 2000 men killed and 2000 prisoners. Thus both wings of the French army were completely defeated; the original position could no longer be held, and all the French corps gathered into two large masses to retreat along the line of the Moselle. Two separate armies were now formed—the one known as the Army of Metz, commanded by Marshal Bazaine, and the other commanded by Marshal MacMahon. By August 14th the first German army had advanced to the immediate neighborhood of Metz, and by a successful attack upon the French Third Corps under Bazaine baffled the first attempt of that commander to retreat to the line of the Marne. This developed into the sanguinary battle of Colombey-Nouilly, or of Courcelles. The Prussians lost nearly 5000 men in killed and wounded; the French loss was about 3500. The battle prevented the junction of Bazaine's army with that of MacMahon at Châlons. In the battle of Mars-la-Tour, or Vionville, fought on August 16th, the army of Bazaine was repulsed by Prince Frederick Charles, and driven back on Gravelotte with immense loss to both sides—about 16,000. On the 18th occurred the great battle of Gravelotte (q.v.), in which 200,000 Germans fought against 130,000 Frenchmen. Bazaine's army, occupying a very strong position to the west of Metz, was, after nine hours' fighting, completely defeated, cut off from its communication with Paris, and driven back toward Metz. The losses were very heavy. The French lost about 600 officers and 13,000 men; the Germans, about 900 officers and 20,000 men.

Bazaine was now shut up in the fortifications of Metz, which was invested by Prince Frederick Charles. A fourth army was organized, and placed under command of the Crown Prince of Saxony, to move rapidly upon Paris. MacMahon, marching to the relief of Metz, was cut off by the third and fourth German armies, which were converging on Paris, and on the first of September was fought the battle of Sedan, the Waterloo of the Second Empire. The forces of MacMahon were caught in an unfavorable position, where they could be attacked from all sides, and were driven upon the fortress of Sedan, where, surrounded and defeated, the entire army surrendered (September 2d), with the Emperor, who was carried prisoner to Wilhelmshöhe. By this capitulation, 83,000 men, including 40 generals, 230 officers of the staff, and 2595 officers, became prisoners of war, in addition to 21,000 men who had been made prisoners during the battle. Meanwhile, on August 31st, Bazaine made a sortie from Metz, attempting, during that day and the following, to break through toward the north, but was driven back into the fortress.

When the news of the capitulation of Sedan and of the capture of Napoleon reached Paris it caused an upheaval. On September 4th the Third Republic was proclaimed, and a Government of National Defense was formed, of which the chief members were Jules Favre, Crémieux, Ferry, Jules Simon, and Gambetta. General Trochu, the military Governor of Paris, was its head. Gradually the Germans closed in on Paris, no serious resistance in the field being attempted. By September 19th the capital was regularly invested. The investing force was far inferior to that of the besieged in numbers, but the French forces in Paris were largely a half-trained provisional levy, brimming with disaffection and the spirit of revolution, which afterwards broke out in the Commune. Strassburg surrendered on September 28th. A few days later Gambetta escaped from Paris in a balloon and issued a proclamation from Tours calling for a levy *en masse*. On October 11th General Von der Tann, after defeating a French force, entered Orleans. On October 27th Bazaine surrendered at Metz with his army of about 175,000 men to Prince Frederick Charles. A gleam of hope was infused into the French by a momentary victory of General Aurelle de Palladines, commander of the Army of the Loire, who on November 9th beat back Von der Tann at Coulmiers, near Orleans, the French reëntering Orleans on the following day. On November 28th, however, Aurelle de Palladines was repulsed at Beaune-la-Rolande, and was again defeated before Orleans on December 2-4. Nor were the other armies put into the field by the appeals of Gambetta more successful in coming to the relief of Paris, where General Ducrot made a desperate attempt to break through the German lines at Brie and Champigny, November 30-December 3. The army of General Chanzy engaged that of the Grand Duke of Mecklenburg on the Loire, December 7-10, but was forced to retreat from this scene of operations, and on January 10-12, 1871, he was completely overthrown by Prince Frederick Charles at Le Mans. In the north, where the Germans had reached and entered Rouen as early as December 6th, the army of General Faidherbe suffered a defeat at Pont Noyelles, December 23d, and another at Bapaume, January 3d, and on January 19th it was overwhelmed by General Von Goeben at Saint Quentin. In the east, General Bourbaki made a diversion at the close of December which was at first successful, but he was repulsed by General Von Werder before Belfort on January 15-17. On December 27th the Germans opened a bombardment on Mont Averon, one of the forts of Paris, and two days later they obtained possession of the fort. After an unsuccessful sortie from Mont Valerien, led by General Trochu, January 19th, Paris, which had reached the point of starvation, capitulated January 28, 1871, a partial armistice having been arranged between Bismarck and Jules Favre. Four days later the remains of Bourbaki's army retired into Switzerland. In the meanwhile, during the progress of the siege of Paris, the work of consolidating Germany into an empire had been consummated by the proclamation at Versailles, on January 18th, of William I. as German Emperor. The armistice gave France an opportunity to form a responsible government that could conduct peace negotiations. On February 8th elections were held for a National Assembly, which met at Bordeaux, February 12th, and which, on February 17th, elected Thiers Chief of the Executive. On February 16th the capitulation of Belfort closed the military operations. The Germans occupied all the forts around Paris. France was helpless, with nearly all her trained soldiers disarmed or prisoners of war, while French territory was occupied by a German army of more than half a million men. The new Government of France now undertook the task of securing peace.

The indefatigable labors of Thiers resulted, on February 26th, in the arrangement of preliminary terms of peace with Germany, which were formally accepted by the National Assembly, March 1st, by a vote of 546 to 107. The terms of this treaty were as follows: (1) The cession by France of the German-speaking part of Lorraine, including Metz and Thionville, and of Alsace, excepting Belfort; (2) France to pay five milliards of francs as war indemnity—one milliard in 1871, and the balance in installments extending over three years; (3) the evacuation of French territory to begin upon the ratification of the treaty, Paris and some western departments to be evacuated at that time, the troops in other departments to be withdrawn gradually as the indemnity was paid; (4) the German troops to be maintained at the cost of France, and not to levy upon the departments occupied by them; (5) inhabitants of the annexed territories to be allowed to choose between the two nationalities; (6) prisoners of war to be immediately set at liberty; (7) negotiations for a definitive treaty of peace to be opened at Brussels after the ratification of this treaty; (8) the administration of the departments occupied by the German troops to be intrusted to French officials under the control of the chiefs of the German corps of occupation. The definitive treaty of peace was signed at Frankfort, May 10, 1871. The two great results of the war were the establishment of the Third Republic in France and the consolidation of Germany into an empire.

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FRANÇOIS, frän'swä', Jean Charles (1717-69). A French engraver, born at Nancy. He was the inventor of engraving in imitation of crayons (1740). This obtained for him the position of engraver to the King, and he received a pension. His works include plates after Van Loo, Holbein, Boucher, and others. His work is of mediocre quality.

FRANÇOIS, Kurt von (1853—). A German cartographer and explorer of Africa. He was born at Luxemburg, and after completing his military education at Wahlstatt and Berlin, served in the German Army during the war of 1870-71, in which his father, General François, met his death at the battle of Spichern. He was a member of Wissmann's African expedition in 1883, and two years later was the companion of that famous soldier and explorer, on the expedition in which two tributaries of the Congo were explored. On a tour undertaken in 1887 he penetrated from the coast at Togo northwestward to about the twelfth parallel, north latitude, and two years later, in recognition of his distinguished services, was appointed commander of the military contingent in German Southwest Africa. As acting Imperial Commissioner, to which position he was appointed in 1891, he explored as far as Lake Ngami. His vigorous warfare against the native chieftain, Henrik Witboi, an inveterate enemy of German domination, resulted in the total rout of the Hottentots. Prevented from following up his victory by reason of disagreements among his officers, and foreseeing the impossibility of a complete subjugation of the enemy under the circumstances, he resigned his commission in 1895. In 1901 he settled in German Southwest Africa. His principal works include: *Im Innern Afrikas; Die Erforschung des Kassai*, in collaboration with Wissmann (2d ed. 1891); and *Die Erforschung des Tschuapa und Lulongo* (1888).

FRANÇOIS, Luise von (1817-93). A German author. She was born at Herzberg, Province of Saxony, and after the death of her father lived for several years at Weissenfels, Minden, and Halberstadt, but chiefly at the house of her uncle, General Karl von François, at Potsdam. Her works embrace mainly novels, and entertaining stories, several of which have become very popular. Among them are: *Die letzte Reckenburgerin*, a novel (6th ed. 1895); *Frau Erdmuthens Zwillingssöhne* (2d ed. 1891); *Stufenjahre eines Glücklichen* (1877); and *Der Katzenjunker* (1879).

FRANÇOIS DE NEUFCHÂTEAU, de nẽ'shȧ'tō', Nicolas Louis François, Count (1750-1828). A French statesman and poet. His first volume of verse was published in 1766. Encouraged by Voltaire, he obtained the chair of rhetoric at Toul in 1770. In 1792 he was Deputy to the National Assembly, of which he became secretary and finally president. In 1793 he was imprisoned for the publication of a comedy, *Paméla, ou la vertu recompensée*. In 1797 he became Minister of the Interior under the Directory, and in 1804-06 he was president of the Senate. After the Restoration he retired from politics. His works include *Fables et contes en vers* (1814), *Les trois nuits d'un goutteux* (1819), and many miscellaneous articles and translations.

FRAN'COLIN (Fr., Sp. *francolin*, Port. *francolim;* probably diminutive of Port. *frango, frangão*, chicken). A bird of the genus Francolinus, of the family Tetraonidæ, closely allied to partridges. They are natives of Asia and Africa. One species only (*Francolinus vulgaris*) was formerly found in the most southern parts of Europe, but is now extinct there, though still common in various parts of Asia and in Cyprus. Most of the thirty species of francolin known are found in Africa, and all are objects of sport, and good for food.

FRANCO'NIA (ML., from OHG. *Franchun*, Franks). The name of a mediæval duchy in Germany, embracing the country on both sides of the Main, from the Rhine to the mountains of Bohemia. The region was conquered by Clovis, and later was dependent upon Austrasia (q.v.). After the Treaty of Verdun (843) it was part of the German kingdom. In 911 Conrad of Franconia was raised to the royal throne, and a century later the choice of the German princes again fell upon the Franconian House, which, by its direct and collateral branches, gave kings and emperors to Germany from 1024, when Conrad II., the Salic, began his reign, till 1125, when Henry V. died, and again from 1138, when Conrad III. ascended the throne, till 1254, when Conrad IV., the last Hohenstaufen Emperor, died. In 1022 Franconia was divided into Franconia Occidentalis and Franconia Orientalis (West and East Franconia). The former, in 1155, passed to Conrad, son of Frederick Barbarossa (q.v.), who was given the title of Count Palatine of the Rhine. During its connection with the Crown, Franconia increased in extent and importance, while its great spiritual principalities of Mainz, Speier, Worms, Bamberg, and Würzburg acquired both wealth and political influence. After 1155 the name Franconia was usually given only to the eastern portions of the ancient duchy. In 1512 Maximilian I. established the circle of Franconia, without, however, including in it the Palatinate. With the dissolution of the Holy Roman Empire in 1806, the name of Franconia disappeared from among the political divisions of Germany, but since 1837 it has been revived in the Kingdom of Bavaria (q.v.), where those portions of the ancient Franconian region which had been known as the circles of the Upper Main, Rezat, and Lower Main are now designated Upper, Middle, and Lower Franconia.

UPPER FRANCONIA includes the northeast portion of Bavaria. It is watered by the Main, Saale, and other streams. Its surface rises in the Fichtelgebirge to a height of 3500 feet. Farther west are the mountains of the Franconian Forest, which are considerably lower. The valleys produce good crops and fruit, and the district is rich in minerals. Population, in 1900, 607,903. The capital is Bayreuth.

MIDDLE FRANCONIA, which borders on Württemberg, is intersected by branches of the Franconian Jura, but has few rivers of importance besides the Regnitz and Altmühl, which are connected by the great Ludwigskanal. It produces good wine, but is principally celebrated for its hop-gardens. Population, in 1900, 815,556. The capital is Anspach. Nuremberg is the principal town.

LOWER FRANCONIA, which occupies the northwest part of Bavaria, is the richest and best cultivated of the Franconian districts, and is celebrated for the excellence of its wines. The district is noted for its mineral springs at Kissingen, Brückenau, and Wipfeld. Population, in 1900, 650,758. The capital is Würzburg.

FRANCONIA MOUNTAINS. See WHITE MOUNTAINS.

FRANCS-TIREURS, frän'tê-rẽr' (Fr., free-shooters). The name given to bands of French soldiers that sprang into existence during the Franco-German War of 1870-71. They had their origin in the military societies formed in northeastern France as early as 1867. They did not form a part of the regular army until November, 1870, and at first their military organization was very imperfect. They waged irregular warfare by attacking small detachments of the enemy and baggage trains as well as single travelers. At first they were not recognized by the Germans as having any military standing at all, and when seized were shot or hanged; but after a time, when they received a better organization, and coöperated with the regular French Army, such recognition was accorded them. They carried on an irregular warfare long after the main French armies had been wiped out. See GUERRILLAS.

FRANCUCCI, från-ko͞o'chê, INNOCENZO. See IMOLA, INNOCENZA DA.

FRANEKER, frän'e-kẽr. A town of the Netherlands, in the Province of Friesland, situated on the canal between Harlingen and Leeuwarden (Map: Netherlands, D 1). It was formerly the seat of a university founded in 1585 by the Frisian States and abolished by Napoleon. Franeker has a church dating from the fifteenth century, a town hall (restored) built in 1591, and a curious astronomical model, showing the motions of the planets, built in 1774-81 by a citizen named Eise Eisinga. Population, in 1890, 7143; in 1900, 7114.

FRANGIPANI, frän'jê-pä'nê (named after the Marquis Frangipani, major-general under Louis XIV.). A scent or perfume, either derived from or manufactured in imitation of a flower produced by a West Indian tree of the genus Plumiera, called the red jasmine.

FRANGIPANI. An illustrious and powerful Roman house, which began with Leo Frangipani in 1014 and attained the summit of its power in the eleventh and twelfth centuries. The residences and strongholds of the Frangipani were near the Arch of Titus and the Coliseum. The rivalry of the Frangipani with the house of the Pierleoni not only occasioned repeated civil wars in the State, but likewise troubles in the Church. In the early part of the twelfth century the two families controlled the college of cardinals. The Frangipani were partisans of the Emperor, the Pierleoni usually opponents. After the death of Frederick II., however, the family interest was enlisted in the Papal cause. Giovanni Frangipani captured Conradin of Hohenstaufen, and delivered him, in 1268, to Charles of Anjou. The origin of the name Frangipani is attributed to the family's benevolent distribution of bread in time of famine. Consult Gregorovius, *Rome in the Middle Ages* (trans., London, 1895-1900).

FRANGIPANI was also the name of a noble family of Croatia, whose members distinguished themselves in the wars against the Turks. The most celebrated of the line were John Frangipani, who about 1390 was made Ban of Croatia, Slavonia, and Dalmatia, and Christopher Frangipani, who fought at Mohács (1526). Francis Christopher Frangipani about 1670 entered into a conspiracy against the Emperor Leopold I., having for its ultimate object the restriction of Germanic influences in Hungary, and the reassertion of the Magyar power. The conspiracy was discovered and Frangipani was executed in 1671.

FRANK, fräŋk, Albert Bernhard (1839-1900). A German botanist. He was born in Dresden, and was educated at Leipzig. From 1881 until his death he was professor of vegetable physiology at the Agricultural College at Berlin. His works consist chiefly of valuable text-books, and include: *Die Krankheiten der Pflanzen* (1880); *Lehrbuch der Pflanzenphysiologie mit besonderer Berücksichtigung der Kulturpflanzen* (1890); *Pflanzenbuch für niedere und mittlere Landwirtschaftsschulen* (1894); *Kampfbuch Gegen die Schädlinge unserer Feldfrüchte* (1897); and with Krüger, *Schildlausbuch* (1900).

FRANK, Franz Hermann Reinhold von (1827-94). A German theologian, born at Altenburg, and educated at Leipzig. He was professor of theology at Erlangen from 1857 until his death, was co-founder of the *Neue Kirchlicher Zeitschrift,* and wrote a large number of works, most of which have been several times republished. These include: *System der christlichen Gewissheit* (2d ed. 1885-86); *System der christlichen Wahrheit* (2d ed. 1885-86); *System der christlichen Sittlichkeit* (1884-87); *Zur Theologie A. Ritschels* (3d ed. 1891).

FRANK, Gustav Wilhelm (1832—). A German theologian, born in Schleiz. He was educated at Jena, and held a professorship at that university from 1864 to 1867, when he was appointed professor of dogmatics and ethics at the University of Vienna. He published an edition of Apelt's *Religionsphilosophie* (1860), and is the author of *Geschichte der protestantischen Theologie* (1862-75); and *Die evangelisch-theologische Fakultät in Wien von ihrer Gründung bis zur Gegenwart* (1871).

FRANK, Jacob (1712-91). A pseudo-Messiah of the Jews and founder of a sect called Frankists after himself, or Zoharites after their sacred book. His real name was Jakob Lebowicz, and he was the son of a rabbi of southern Galicia. When a young man, traveling in the East, the Turks called Jakob a Frank, their common appellation for a European, and this surname he always retained. After his return to Poland he settled in Podolia and gathered around him many rabbis and persons skilled in the science of the Cabala. He represented himself to be the second Messiah and had many followers. In 1756 he was arrested and imprisoned for a time, but was released and soon after, with many of his followers, professed Christianity. He quickly, however, resumed his earlier Messianic pretensions, made large collections of money from his adherents in Poland and Bohemia, and went to Brünn in Moravia, where he lived luxuriously on the offerings of his followers. In 1786 he removed to Offenbach, where he displayed even greater magnificence, declaring himself to be the Messiah, and regarded as immortal by his adherents, until he was stricken down with apoplexy December 10, 1791. The sect still exists in Poland, numbering among its members persons in Poland, Rumania, and Turkey. Consult Graetz, *Frank und die Frankisten* (Breslau, 1868).

FRANK, Johann Peter (1745-1821). A German physician. He was born at Rothalben, Bavaria, and studied medicine at Heidelberg and Strassburg. In 1785 he accepted a call to Pavia, where he remained until his appointment to the directorship of the General Hospital at Vienna (1795). With this institution he was associated until 1804, during which time he also delivered lectures at the university. After a short term as professor of medicine at Vilna, Russia, he was appointed physician in ordinary to Czar Alexander I., returning to Vienna in 1808. His influence upon the development of medical practice in Lombardy, Austria, and Russia was extraordinary. He devoted himself chiefly to the improvement of public sanitation, of which he has been called the founder, and several of the works written by him on this subject have served as a basis for the further development of sanitary legislation. His principal works include: *System einer vollständigen medizinischen Polizei* (6 vols., 1779-1819, supplement, 3 vols., 1812-27; translated into Italian, 1808-30); *De Curandis Hominum Morbis Epitome* (6 vols., 1792-1821; German trans., 3d ed. 1840-41); *System der Landwirtschaftlichen Polizei* (1789-91); and *Selbstbiographie* (1802).

FRANK'ALMOIGNE (Lat. *libera eleemosyna,* free alms). A form of feudal tenure, whereby lands were held by religious houses or persons for charitable purposes. By the ancient common law of England, a man could not alien lands which came to him by descent without consent of his heir, but he might give a part to God in free alms. It was an old Saxon tenure, and continued under the Norman revolution, through the great respect that was shown to religion and religious men. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical foundations hold them at this day. The statute of 12 Car. II., c. 24, which abolished the old tenures, specially reserved tenure in frankalmoigne. The condition on which lands in frankalmoigne were held was, that masses and divine services should be said for the grantor and his heirs, but no particular service was specified. At the Reformation, the nature of the services was changed, but the tenure was suffered to continue. A tenant in frankalmoigne did no fealty to his overlord, and in the event of failure to perform the service the latter was not entitled to distrain, but might complain to the ordinary or visitor. In this respect this tenure differed from tenure by divine service, i.e. where lands were given on condition of performing a specified service, as saying a mass on a particular day, or distributing certain alms. In this case the tenant was bound to render fealty, and the lord was entitled to distrain on failure to perform the service. By the Anglo-Saxon law lands held in frankalmoigne were subject to the *trinoda necessitas,* or repairing highways, building castles, and repelling invasions. In Scotland lands conveyed to the Church *in puram eleemosynam* were said to be mortified. See Fee; Feudal System; Tenure. Compare Mortmain.

FRÄNKEL, frĕn̲k′*e*l, Bernhard (1836—). A German physician. He was born at Elberfeld, and was educated at Würzburg and Berlin, where in 1884 he was appointed professor. In recognition of his valuable investigations on diseases of the throat and nose, he was, in 1887, made director of the clinical institute of the university especially devoted to the treatment of those diseases. In addition to the treatise entitled "Allgemeine Diagnostik und Therapie der Krankheiten der Nase," in Ziemssen's *Handbuch der speziellen Pathologie und Therapie*, vol. iv. (1879), he wrote "Skrofulose und Tuberkulose," in Gerhardt's *Handbuch der Kinderkrankheiten*, vol. iii. (1878); and *Der Kehlkopfkrebs* (1889).

FRÄNKEL, Wilhelm (1841-95). A German engineer. He was born at Odessa, Russia, and was educated at the Polytechnic Institute at Dresden, where he was appointed professor in 1865. His devices for gauging the carrying capacity of iron bridges have been widely adopted. His articles on bridge and railroad construction include "Bewegliche Brücken," in the *Handbuch der Ingenieur-Wissenschaften* (2d ed. 1888).

FRANKENBERG, frän̲k′*e*n-bĕrk. A flourishing manufacturing and trading town of Saxony, Germany, 32 miles southwest of Dresden, and near Chemnitz (Map: Germany, E 3). It has manufactures of cottons, woolens, silk stuffs, cigars, Venetian blinds, and the largest calico-printing works in Saxony. There are a number of picturesque castles and churches in the vicinity, and an iron cross, dedicated to the poet Körner, is to be seen in a spot made famous by one of his ballads. Population, in 1890, 11,400; in 1900, 12,726.

FRANKENHAUSEN, frân̲k′*e*n-hou′z*e*n. A town of the Principality of Schwarzburg-Rudolstadt, Germany, on the Wipper, 27 miles north-northwest of Weimar (Map: Germany, D 3). There are productive salt springs here, and the manufacture of cigars, sugar, and articles in mother-of-pearl is carried on. The salt baths are much frequented. In the neighborhood are mines of lignite, and the Barbarossa cavern, discovered in 1865. Population, in 1890, 5944; in 1900, 6383. Frankenhausen figures in history as the scene of a battle between the rebellious peasants under Thomas Münzer, May 15, 1525, and the Saxon, Brunswick, and Hessian troops, in which the peasants were defeated.

FRANKENSTEIN, frän̲k′*e*n-stīn, or, The Modern Prometheus. A novel by Mrs. Shelley, begun in 1816, and published anonymously at London in 1818. An American edition appeared at Philadelphia in the same year, and another at Boston in 1869. The title character of the tale is a student who finds the secret of creating life artificially. His first creation is a horrible yet pathetic monster, who murders his friend and pursues Frankenstein himself from one land to another, complaining of his loneliness and begging his unfortunate maker to create a mate for him.

FRANKENTHAL, frän̲k′*e*n-täl. A flourishing industrial town of Germany, situated in the northeastern part of the Bavarian Palatinate, about 10 miles northwest of Mannheim and near the Rhine (Map: Germany, C 4). Its only particular object of interest is the portal of the Abbey Church, founded in 1119. The industrial establishments of Frankenthal include machine-shops, iron-foundries, and sugar-refineries. Frankenthal is named as early as the eighth century. Population, in 1895, 14,445; in 1900, 16,849.

FRANK′FORT, or **FRANKFORT-ON-THE-MAIN** (Ger. *Frankfurt am Main, pron.* fränk′-fo͞ort äm mīn). A city of Prussia, in the Province of Hesse-Nassau, government district of Wiesbaden, situated on the right bank of the navigable Main (Map: Prussia, C 3). It lies in a fertile and picturesque plain surrounded by mountains, and embraces the important suburb of Sachsenhausen on the left bank, connected with the main city by several stone or iron bridges. Frankfort still has many old and narrow streets with high-gabled projecting houses; but its ancient walls and ramparts have been converted into promenades, and there are now wide handsome streets and broad quays in the modernized sections. The gates of the famous Judengasse, which were closed at night to prevent the egress of the Jewish inhabitants, were razed at the time of the French occupation in 1806. Gradually all the interesting old houses in this street, now called Börnestrasse, have been torn down, except the family house of the Rothschilds, one of the attractions for sightseers. In the heart of the ancient town is the Römerberg, or market-place, with the Justitia Fountain in its centre. It was the scene of popular rejoicings after the election of an Emperor. Hebrews were formerly not allowed to enter this square. The main artery of the new town is the Zeil, continued by the Kaiserstrasse. The most prominent squares are the Rossmarkt with the Gutenberg Monument, the Goetheplatz with Schwanthaler's statue of Goethe, the Schillerplatz with the statue of Schiller, the Kaiserplatz with an attractive fountain, the Börsenplatz, and the Opernplatz. Among the spacious streets leading to the outer quarters of the city the Bockenheimer Landstrasse is the most noteworthy.

The ancient Cathedral of Saint Bartholomew ranks first among Frankfort's ecclesiastical structures. Founded about 870, it was built after Gothic patterns at different periods between 1235 and 1415. The election, and from 1562 the coronation, of the German emperors took place here. The Wahlkapelle (election chapel) dates from 1355. Of the other churches, there may be mentioned the Church of Saint Leonhard, erected in 1219-1507; the Nikolaikirche, a graceful edifice of the thirteenth century; the Katharinenkirche, built in 1680, containing fine monuments and paintings; and the new Church of Saint Peter. The Paulskirche, erected in 1787-1833, is memorable as having been the seat of the German National Parliament of 1848-49. The most prominent among the ancient secular buildings is the Römer, which is in reality a group of twelve separate mediæval houses, reconstructed and enlarged at various times. Here in the Kaisersaal, or Imperial Hall, the newly elected Emperor held his public banquet. The hall is embellished with good modern portraits of all the German emperors. Other interesting old structures are the Leinwandhaus, or Draper's Hall, now the Municipal Historical Museum, containing a valuable collection of antiquities and some paintings, and among whose documents the Golden Bull is preserved (see HISTORY below); the Gothic Haus Fürsteneck; the Steinerne Haus of 1464; the Haus zum grossen Engel of 1562, half Gothic and half Renaissance; the Tuchgaden, where the guild of butchers was wont to celebrate the coronation of the emperors; the Goldene Wage, with an ornate façade; and the Haus zum Rebstock with its picturesque court. More famous is the Goethe house, in which the poet was born and spent his boyhood. The house is now to be seen as it was in Goethe's youth, the restorations and refurnishings being due to the Deutsche Hochstift. The adjoining Goethe Museum contains portraits, autographs, letters, etc., and also the Goethe Library—a specialized collection of the works of the best German period.

Among the modern public buildings are the City Library, having a fine Corinthian portico; the Municipal Record Office; the new Exchange with a handsome hall and rich façade; the beautiful opera house, accommodating 1900 spectators; the law courts and the post-office, and the magnificent Central Railway station, opened in 1887, unsurpassed by any structure of its kind on the Continent. In Sachsenhausen is situated the splendid Städel Art Institute, in the Italian Renaissance style, with a fine portal and a dome. Its notable picture gallery is especially rich in specimens of the Dutch and the early Flemish masters, and of the older Düsseldorf School. Hals, Brouwer, Teniers the Younger, Van der Weyden, and Van der Velde are well represented; and Van Eyck and Moretto merit particular attention. Among the moderns, Overbeck, Veit, Lessing, Böcklin, and Lenbach are also to be seen to advantage. The gallery comprises, in addition, some interesting sculptures, and one of the best collections of engravings in Germany (numbering 60,000 examples), and a school of art for students of painting, sculpture, and architecture. The environs and the public grounds which surround Frankfort, on the site of the ancient fortifications, are very attractive. The Taunus promenade is especially noteworthy. Among the statues and monuments not already mentioned are those of William I., Börne, and Charlemagne (on the picturesque mediæval Old Bridge across the Main), and Schopenhauer, who lived in Frankfort from 1831 to 1860.

The important commercial standing of Frankfort is due chiefly to its financial strength, although its industries developed considerably during the last quarter of the nineteenth century. The manufactures include chemicals (principally printer's ink), gold and silver wire, machinery, carpets, drugs, tobacco, and electric supplies. The city is the seat of many of the most important industrial and mercantile associations of southern Germany, as well as the home of some of the strongest moneyed institutions in the world, the banks of Frankfort having been famous since the days of the early Rothschilds. Commercially it was well known as early as the sixteenth century, when its semi-annual fairs attracted merchants from every direction. With the establishment of the German Customs Union and the development of Continental railway systems, its advantages have considerably diminished in importance. The supremacy in the book-publishing trade, which Frankfort enjoyed for many generations, was long ago gained by Leipzig. The city is one of the most important railway centres of Europe; and its shipping, due to the recent canalization of the Main and important improvements of the river harbor, has considerably increased. In 1900 the arrivals and departures of ships were over 10,000.

The government is administered by a chief burgomaster, an assistant burgomaster, 24 magistrates, 3 assessors, and a council of 64 members. The municipality operates its own water-works and gas plant, but has leased its street railways to a private company. The water-supply is excellent, the city having of late expended 30,000,000 marks ($7,140,000) on this service. The superior sanitary conditions have reduced the death-rate to a low figure. Frankfort's municipal debt in 1900 was about $23,000,000, of which more than one-half stood for property representing value of more than twice this particular indebtedness. For schools there is annually expended about $1,000,000; for charities, $200,000; for the street-cleaning service, $170,000; for police, $58,000. The educational institutions include three gymnasia, a number of Realschulen, twenty-five public schools, an industrial art school, several music schools, a teachers' seminary, and several homes for imbecile and physically deformed children. The Museum of Art and Industry has an interesting collection of furniture, china, bronzes, panelings, etc. The municipal library contains about 262,000 volumes, 414,000 manuscripts, a collection of coins, and Marchese's marble statue of Goethe. There are also not a few smaller public libraries, with reading-rooms, several learned societies, art leagues, and botanical and zoölogical gardens, besides the many museums. The three important theatres receive subsidies from the city. The hospitals and other charitable institutions are numerous and creditable examples of their kind.

The figures for the population of Frankfort have more than doubled since 1880, partly because the outlying districts have been absorbed. The inhabitants then numbered 136,819, as against 40,000 in 1800. By 1890 the total had reached 179,985, and in 1900, 288,989. About 60 per cent. of the population is Protestant.

HISTORY. Although Frankfort does not appear in history until 793, it is probable that at a very early period some settlement occupied the present site of the city, which was then the meeting-place of a number of Roman military roads running from Mainz east. In 794 Charles the Great held a church council at Franconovurd (see FRANKFORT, COUNCIL OF), and mention is made at the same time of a palace there, which Charles's son, Louis the Pious, greatly enlarged in 822 and made his residence. After the partition of Charles's empire, Frankfort became the capital of the East Frankish Kingdom, and as such it frequently appears in the documents of the time in connection with many important diets and ecclesiastical assemblies. Its political importance declined after the extinction of the Carolingian dynasty, but it still remained an important centre of trade. After 1152 the kings of the Romans were chosen at Frankfort; and this custom was formally sanctioned by the Golden Bull of 1356, which made it the *Wahlstadt*, or Electoral City of Germany. In 1245 Frankfort attained the rank of a free Imperial city, and from that time until about the middle of the fourteenth century it steadily acquired greater powers of self-government, including an independent mint. Frankfort adopted Protestantism about 1530, and in 1536 it joined the Schmalkaldic League (q.v.). After the middle of the sixteenth century the German emperors were crowned here. The town suffered severely from pestilence during the Thirty Years' War. Like many another city of Germany, it was ruled for hundreds of years by a merchant oligarchy, which bitterly resisted all attempts on the part of the guilds to secure a share in the government. In 1612 a popular insurrection under the leadership of one Fettmilch broke out against the misgovernment of the patrician families. The lower classes improved the opportunity to vent their spite upon the Jews, who from an early period constituted an important element of the population. The Jews were forced to flee from the city, and for four years the popular leaders were in power. Order, however, was restored in 1616 by the intervention of the Emperor. The Jews were restored, and the only result of the insurrection was to strengthen the ruling oligarchy. In the revolutionary wars, Frankfort was occupied by the French in 1792, in 1796, and again in 1806. In 1806 it ceased to be a free Imperial city, and was given by Napoleon to Dalberg, the Primate of the Confederation of the Rhine. In 1810 Napoleon created for Dalberg the Grand Duchy of Frankfort, having an area of about 2000 square miles. This disappeared with the downfall of Napoleon, and Frankfort regained its rank (along with Hamburg, Bremen, and Lübeck) as a free city at the Congress of Vienna, and in 1816 became the capital of the German Confederation. During the revolutionary period of 1848 it was the very centre of German nationality and the battleground of the opposing tendencies of the time. The Vorparlament (q.v.) met there on March 31, 1848, and from May 18, 1848, to May 30, 1849, it was the seat of the National Assembly convened to bring about the reconstitution of Germany. The period after 1850 was marked by the abandonment of the old oligarchic constitution and the enactment of liberal legislation. Freedom of labor was then completely established for the first time, and the Jews were emancipated. In the war of 1866 Frankfort embraced the cause of Austria. The city was occupied by the Prussians on July 16th, and on October 18th it was incorporated with Prussia. On May 10, 1871, the definite treaty of peace, marking the end of the Franco-German War, was signed at Frankfort. Consult: Battonn, *Oertliche Beschreibung von Frankfurt* (Frankfort, 1861-75); Bleicher, *Statistische Beschreibung der Stadt Frankfurt am Main und ihrer Bevölkerung* (2 parts, ib., 1892, 1895); Wolff and Jung, *Die Baudenkmäler in Frankfurt* (ib., 1895); Horne, *Geschichte von Frankfurt* (ib., 1893); Stricker, *Neuere Geschichte von Frankfurt seit 1806* (ib., 1874-81); Mentzel, *Frankfurt am Main, Ein Städtebild* (ib., 1898).

FRANKFORT. A city and the county-seat of Clinton County, Ind., 45 miles northwest of Indianapolis; on the Lake Erie and Western, the Vandalia Line, the Louisville, New Albany and Chicago, and the Toledo, Saint Louis and Kansas City railroads (Map: Indiana, C 2). It has a public library, and a fine court-house and high-school building. The city is in a productive agricultural district, has a supply of natural gas, and manufactures brick and tile, lumber, flour, brick-making machinery, agricultural implements, crackers, etc. There are also large wholesale grocery establishments. The electric-light plant is owned by the municipality. Population, in 1890, 5919; in 1900, 7100.

FRANKFORT. A city, the capital of Kentucky, and the county-seat of Franklin County, 55 miles east of Louisville; on both sides of the Kentucky River, which is spanned by a suspension bridge 700 feet long, and on the Louisville and Nashville and the Chesapeake and Ohio railroads (Map: Kentucky, G 2). The city is situated amid picturesque scenery, in the heart of the 'Blue Grass' region of the State. On one of the hills near by is the Franklin Cemetery, which ranks with the most beautiful in the South, and in which are buried Daniel Boone and other persons prominent in the history of the State. There are monuments to the soldiers who died in the wars of 1812 and with Mexico. Among the prominent buildings are the State House, the Governor's Mansion, the State Arsenal, the State Penitentiary, the State Home for Feeble-Minded Children, and the State Colored Normal School. The State Library has over 100,000 volumes. The river is navigable, and, by means of a lock and a dam, furnishes abundant water-power. Frankfort carries on a very considerable trade, and has extensive manufactures of lumber, whisky, flour, chairs, shoes, twine, carriages, etc. The government, under a charter of 1893, is vested in a mayor, elected every four years, and a municipal council, which elects most of the administrative officials not chosen by popular vote. Population, in 1890, 7892; in 1900, 9487.

Frankfort was founded in 1786, by Gen. James Wilkinson, who made it the centre of his commercial operations, and, for a time, of his Spanish intrigues. In 1792 it became the capital of the State, though five years later it had a population of only 441, of whom 112 were slaves. In the fall of 1862, during the Civil War, Frankfort was occupied by the Confederate General Braxton Bragg (q.v.), and in the presence of the Confederate Army and a large crowd of citizens, Richard Harves, the chosen representative of the Confederate faction of the State, was, on October 4th, formally inaugurated Governor. The approach of General Buell forced Bragg to evacuate on the same day. In 1900 William Goebel, Democratic Governor-elect, was assassinated here, and Frankfort was the centre of considerable excitement during the prolonged controversy over the Governorship.

FRANKFORT, Council of. An assembly convened at Frankfort-on-the-Main by Charles the Great in 794, and attended by all the bishops and many ecclesiastics of the Frankish kingdom, Italy, Aquitania, and even by some ecclesiastics from England. Its principal business related to: (1) The doctrine of Adoptianism (consult Adoptian Controversy), as recently revamped by Elipandus and Felix; and (2) the decision of the Second Council of Nicæa, held in 787, in favor of image-worship. The first of the fifty-six canons of the Council condemned Adoptianism, and the second repudiated image worship. The canons of the Council have the customary range, and touch upon many matters. Two of them of more than curious interest are (1) the thirty-third: "The Catholic belief in the Holy Trinity, the

Lord's Prayer, and the Apostles' Creed should be preached and taught to every one"; and (2) the fifty-second: "Let no one fancy that God can be prayed to only in three languages, because God may be worshiped in all languages, and will hear the prayers of all men if they are for proper things." Consult: Mombert, *Charles the Great* (New York, 1888); Hefele, *Conciliengeschichte* (Freiburg, 1874). The original canons are in Migne, *Patrol Lat.*, xcvii. See CAROLINE BOOKS.

FRANKFORT-ON-THE-ODER, ō′dẽr. The capital of a government in the Prussian Province of Brandenburg, situated on both sides of the Oder, 50 miles east-southeast of Berlin (Map: Prussia, F 2). It consists of the old town on the left bank and a number of suburbs. On the west of the old town are beautiful promenades laid out on the site of the ancient ramparts. Frankfort has a number of fine streets and squares adorned with monuments. Among the older churches are the Church of Saint Mary, a brick building of the thirteenth century, with wood carvings, stained glass, and a candelabrum thirteen feet high, and the Reformed Church, built in the Transition style at the beginning of the thirteenth century, and recently renovated. The splendid Rathaus, dating from the beginning of the seventeenth century, and the municipal theatre, are among the most noteworthy secular buildings. Frankfort has a monument to the poet Ewald von Kleist (q.v.), and an especially fine monument by Unger to Prince Frederick Charles (died 1885). The university, established in 1506, was transferred in 1811 to Breslau. Frankfort has a gymnasium, founded in 1694, Realgymnasium, and a number of other institutions for secondary education. The benevolent institutions include one municipal and four private hospitals, and two orphan asylums.

The manufactures of Frankfort include machinery, boilers, and other iron products, glass articles, pottery, musical instruments, chemicals, chocolate, sugar products, paper, leather, etc. The extensive railway shops furnish employment to over 1000 hands. The trade of Frankfort is, however, in a state of decadence, owing to the proximity of Berlin and to the decline of the town's three annual fairs. There is good water and rail communication, and an electric street railway accommodates local traffic. Population, in 1890, 55,738; in 1900, 61,852, including 4134 Roman Catholics and 747 Jews. The position of Frankfort early gave it great commercial importance in the trade with Poland. After receiving municipal rights in 1253, it soon developed into a commercial centre of considerable magnitude. The town suffered in the Thirty Years' War and the Seven Years' War as well as during the Napoleonic wars.

FRANKINCENSE (from OF. *franc encens*. ML. *francum incensum*, pure incense, from *francus*, pure; probably connected with OHG. *Franko*, Frank, Lat. *Franci*, Franks, AS. *franka*, Icel. *frakki*, spear + *incensum*, incense, from Lat. *incendere*, to burn, from *in*, in + *cendere*, to burn). A name employed to designate various resinous substances which diffuse a strong fragrance in burning, and which are on that account used in certain religious services. There is good reason to believe that the frankincense of the Jews, and also of the ancient Greeks and Romans, was chiefly or entirely the substance now known as olibanum (q.v.), the product of an Indian tree, *Boswellia serrata*. It was formerly supposed to have been obtained from some species of Juniperus, which are generally believed not to yield such a product; the prized frankincense of the ancients was brought from the East. Several trees, such as certain species of Protium and of Croton, yield substances used as frankincense in place of olibanum. The silver fir in Europe furnishes a resinous product which is the common frankincense of the pharmacopœias. American turpentine is also often sold under this name. It is used in the composition of stimulating plasters, etc. Burgundy pitch is made from it. It is a spontaneous exudation from the tree, hardening by exposure to the air, and is generally of a whitish or pinkish color, with a rather agreeable odor and a balsamic taste. See BOSWELLIA; FIR.

FRANKING PRIVILEGE. The right of sending mail matter free of charge. In England this privilege was secured to members of Parliament at first by warrant of the Postmaster-General and latterly by statute. It was abolished in 1840. In this country the privilege was accorded by statute to Revolutionary soldiers in actual service, to various executive officers of the United States Government, as well as to Senators and members of Congress. It was abolished in 1873, but formally restored a few years later, and at present officers of the United States Government may send and receive through the mails all public documents without payment of postage, the name and office of the sender being written thereon. This privilege does not extend, however, to those officers who are authorized to make requisitions upon the Postmaster-General for official postage stamps. Seeds and agricultural reports may be mailed free by the Commissioner of Agriculture and by members of Congress. The franking privilege is frequently abused. As no penalty is attached to the improper use of the frank, it has been recommended that a penalty be imposed by act of Congress. Many officers are allowed to send their communications in unstamped envelopes marked 'official business.' An unlawful use of such an envelope subjects the user to a penalty of $300.

FRANKISH VERSION. See BIBLE.

FRANKL, frän′kl′, LUDWIG AUGUST, Ritter von Hochwart (1810-94). An Austrian poet. He was born in Bohemia, of Jewish parentage, and was educated in medicine in Vienna, but preferred journalism and literature. His *Habsburglied* (1832), a series of ballads in chronological order, placed him among the romanticists. Among his best known works are *Sagen aus dem Morgenlande* (1834), and the epic *Christoforo Colombo* (1836). In 1856 he established a school in Jerusalem, and described the condition of the Orient in *Nach Jerusalem* (1858) and *Aus Aegypten* (1860). Jewish subjects are treated by him in the two poems *Rahel* (1842) and *Der Primator* (1864), and in the historical work *Zur Geschichte der Juden in Wien* (1853). Frankl also took an active interest in the philanthropic work of Vienna and in public affairs, especially in 1848, when the liberal spirit of his poetry made him widely known.

FRANK′LIN. A district of Canada, formed in 1895. It is composed of numerous large and small islands north of the mainland, including

Baffin Land and Prince Albert Land (Map: Canada, N 2). The area is estimated at 299,000 square miles. Franklin is mostly within the Arctic Circle, and is almost wholly destitute of animal and vegetable life. The only inhabitants are some Eskimo on Baffin Land.

FRANKLIN. A city and the county-seat of Johnson County, Ind., 20 miles south of Indianapolis; on the Cleveland, Cincinnati, Chicago and Saint Louis and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads (Map: Indiana, C 3). It is the seat of Franklin College (Baptist), opened in 1834, and has fine county buildings. The city is in an agricultural region; its industrial establishments include a foundry, elevators, flour, planing, and saw mills, etc. Population, in 1890, 3781; in 1900, 4005.

FRANKLIN. A city and the county-seat of Simpson County, Ky., 133 miles south by west of Louisville; on the Louisville and Nashville Railroad (Map: Kentucky, E 4). It has the Franklin Female College and Franklin Military Institute. The industrial establishments include flouring-mills, a planing-mill, a woolen-mill, brick-works. etc. Population, in 1890, 2324; in 1900, 2166.

FRANKLIN. A town and the parish-seat of Saint Mary Parish, La., 100 miles west by south of New Orleans; on Bayou Teche, and on the Southern Pacific Railroad (Map: Louisiana, D 4). The bayou is navigable for steamers, and the town carries on a considerable trade in cotton, sugar, fruits, etc. There are several sugar and saw mills. Population, in 1890, 2127; in 1900, 2692.

FRANKLIN. A town in Norfolk County, Mass., including the village of Unionville, 27 miles southwest of Boston; on the New England Railroad (Map: Massachusetts, E 3). It has an almshouse, a public library, and Dean Academy, an endowed school for both sexes. Its manufactures include pianos, straw hats, and cotton, woolen, and felt goods. Franklin was originally a part of Wrentham, and was incorporated as a separate township in 1778. The government is administered by town meetings. Population, in 1890, 4831; in 1900, 5017.

FRANKLIN. A city in Merrimack County, N. H., 95 miles northwest of Boston, Mass.; at the confluence of the Pemigewasset and Winnepesaukee rivers, which here unite in the Merrimac, and on the Boston and Maine Railroad (Map: New Hampshire, H 8). Abundant water-power has contributed materially to the city's industrial importance. There are paper and pulp mills, hosiery-mills, foundries, and manufactures of needles, knitting-machines, woolen goods, boxes, etc. Franklin is famous as the birthplace of Daniel Webster, and has the New Hampshire Orphan's Home. It was incorporated as a town in 1828, and in 1895 received a city charter, now in operation, which provides for a mayor, elected annually, and a unicameral council. The city owns and operates its water-works. Population, in 1890, 4085; in 1900, 5846.

FRANKLIN. A city and the county-seat of Venango County, Pa., 123 miles by rail north of Pittsburg; on the Allegheny River, and on the Allegheny Valley, the Erie, the Western New York and Pennsylvania, and the Lake Shore and Michigan Southern railroads (Map: Pennsylvania, B 2). It has a public library and two fine parks, besides several points of historic interest. The centre of the great oil region of the State, Franklin's chief interest is in oil, though there are also flouring-mills, machine-shops, brick-works, and manufactures of steel castings, tools, and oil-well supplies. Franklin was settled about 1753, and was incorporated in 1795. The government is administered under a special charter of 1868, subsequently amended, which provides for a mayor, elected annually, and a unicameral council. Population, in 1890, 6221; in 1900, 7317.

FRANKLIN. A town and the county-seat of Williamson County, Tenn., 20 miles south of Nashville; on the Harpeth River, and on the Louisville and Nashville Railroad (Map: Tennessee, E 5). It is the seat of the Tennessee Female College, opened in 1856. The town is the centre of a fertile agricultural region, and has several cotton-gins, and manufactures of carriages, flour, lumber, etc. Population, in 1890, 2250; in 1900, 2180. An engagement between the Federal General Granger and the Confederate General Van Dorn occurred here on April 10, 1863, the latter making the attack and being repulsed; and here, on November 30, 1864, was fought the famous battle of Franklin. See FRANKLIN, BATTLE OF.

FRANKLIN (from ML. *franchilanus*, from *franchus*, free). An English freeholder of former times, who held his lands of the Crown free from any feudal servitude to a subject superior. He is one of the characters described by Chaucer. In the course of time he lost his dignity, becoming a well-to-do yeoman. Consult: Chaucer, *Prologue to the Canterbury Tales;* Shakespeare, *Henry IV., Part I.* (Act ii., Scene 1, and *Winter's Tale* (Act v., Scene 11).

FRANKLIN, BATTLE OF. A sanguinary battle fought at Franklin, Tenn., on November 30, 1864, between a Federal army of about 25,000, under General Schofield, and a Confederate army of about 40,000, under General Hood. Early in November, 1864, General Schofield, acting under orders from Thomas, took command at Pulaski, Tenn., of a Federal force of about 25,000. On the 21st Hood advanced against this position, and Schofield gradually withdrew before him toward Nashville, under instructions to impede the Confederates until Thomas should have fully prepared himself for action. Confederate movements by the rear and by the right flank were balked by Schofield at Columbia and Spring Hill on the 24th and the 29th respectively, and by a rapid night's march, in which he passed by the sleeping Confederate army, Schofield reached Franklin at dawn of the 30th, and, in the absence of pontoon bridges, immediately set about improvising bridges for transferring his army and stores across the Harpeth River. He also threw up breastworks on the left bank to meet a possible Confederate attack, and stationed General Wagner, with two brigades, somewhat in advance, with instructions to withdraw behind the intrenchment on the approach of the Confederates, without awaiting a general attack. Meanwhile Hood, chagrined over the previous day's failure at Spring Hill, had come up, and at 4 P.M. ordered an attack. Wagner, imprudently delaying, lost heavily, and his men, enveloped by the Confederate advance, hastily retreated through the Federal centre, which was soon thrown into great confusion. General Opdyke, without orders, threw his brigade into the resulting gap, and thus, by enabling the Federals to reform, saved the day. Thereafter until almost midnight the fighting continued, the Confederates making repeated and desperate assaults only to be beaten back each time with disproportionate loss by the Federals, under the immediate command of Gen. J. D. Cox, General Schofield being on the right bank of the river. During the night Schofield withdrew unmolested to Nashville, where he joined Thomas. The battle is notable for the remarkable gallantry of the Confederates and the stubborn bravery of the Federals. The Federal loss in killed, wounded, and missing was 2326; that of the Confederates, though not accurately known, probably exceeded 6000. Consult: Cox, *The Battle of Franklin* (New York, 1897); id., *The March to the Sea, Franklin and Nashville* (New York, 1882); Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. iv. (New York, 1887); and Nicolay and Hay, *Abraham Lincoln: A History*, vol. x. (New York, 1890).

FRANKLIN, Benjamin (1706-90). An American statesman, scientist, and author. He was born in Boston, Mass., January 17, 1706. His father, Josiah Franklin, emigrated to America about 1685, and took up the business of tallow-chandler. His mother, a second wife, was the daughter of Peter Folger, a leading settler, noted for his philanthropy and tolerance. Benjamin, the fifteenth of seventeen children, was named after his father's favorite brother, and, as the tenth son, was intended as the 'tithe for the ministry.' Either on account of poverty or an early perceived distaste on the boy's part, the theological idea was given up. After a year or more at candle-making in his father's shop, Benjamin was apprenticed to his brother James, a printer, and the founder of the *New England Courant*, one of the earliest papers in America. While in this office Franklin learned the trade well, read diligently, and found time to write pieces in the style of the *Spectator*, and even ballads, which he had published in the *Courant* anonymously. For some political opinions James Franklin was imprisoned a month and forbidden to publish his paper. For a while it appeared under Benjamin's name; but there was continual quarreling between the two brothers. At last the apprentice broke his indentures and slipped away by sea to New York. Finding no work there, he went on to Philadelphia, where he arrived friendless and almost penniless. Though only seventeen years old, he was a good printer and of pleasing address, and quickly found both friends and work. In 1725 Sir William Keith, the Governor, induced him to go to England to buy type for a printing shop of his own, promising him a letter which would give him aid in the way of money. Franklin reached England, found his patron's promises worthless, and had to shift for himself. For a year and a half he maintained himself as a printer, living a wild sort of life, and gaining some notoriety by a free-thinking pamphlet which he printed, but afterwards repudiated as immature. Returning to Philadelphia in 1726, he was clerk for a while in a newly started dry-goods shop. He soon got back to printing, however, first with his old employer, Keimer, and then in an independent shop for which he furnished skill and energy and his partner the money. In 1729 Franklin got control of the *Pennsylvania Gazette*, which Keimer had started, and the excellence of the printing and the spirit of the writing won him a competence and high consideration throughout the Colonies. In 1730 he married Miss Deborah Read, the daughter of the man whom he had lodged with on his first coming to Philadelphia. From this time on he was engaged almost constantly in some sort of public activity, and his achievements were varied. In 1731 he began the Philadelphia Library, chartered in 1742, the first and model of the American system. *Poor Richard's Almanac* he first published in 1732, under the pseudonym of 'Richard Saunders,' and for twenty-five years his witty, worldly-wise sayings in this were very influential in molding the new American character. In 1736 he became clerk of the General Assembly, and the next year was appointed postmaster for Philadelphia. In 1743 he broached a plan for an academy, which was later adopted and developed into the University of Pennsylvania. In 1744 he founded the American Philosophic Society. During this period also he invented the excellent Franklin stove, led in the improvement of the city's lighting, paving, polic, and fire departments, and yet found time to conduct the electrical investigations which have placed him in the rank of the great discoverers. In 1752 he made his celebrated experiment with the kite, which demonstrated the identity of lightning with electricity. Franklin's scientific views won their way through surprised incredulity into acceptance both in France and England. The degree of LL.D. was voted him by Oxford, Edinburgh, and Saint Andrews, and he became F.R.S. and was awarded the Copley gold medal in 1775.

In 1753 Franklin was appointed Postmaster-General for the Colonies. In 1754 he was commissioner from Pennsylvania at the Intercolonial Congress which met at Albany to take measures in view of the threatened French and Indian War, and he proposed a plan combining local independence with union. (See Albany Convention.) It seems probable that if this plan had been followed many of the causes which led to the Revolution would have been avoided, and perhaps the Revolution itself. When the French and Indian War came on, Franklin assisted Braddock greatly, giving his personal security for supplies and transportation furnished by the Pennsylvania farmers. The descendants of William Penn, the proprietors of the Colony, refused to allow their private lands to be taxed for the support of the English troops, and in 1764 Franklin was sent to England to petition the Crown against this. This mission conducted satisfactorily, he remained in England as the leading representative for the Colonies. His influence in 1766 helped to secure the repeal of the Stamp Act; but he did not fully appreciate the depth of the feeling in America in regard to taxation, and when he urged the colonists to pay the later small tax on tea, he was roundly charged with lack of patriotism. In 1775, seeing war to be inevitable, he returned, and was immediately chosen a delegate to Congress. He was on the committee to draft the Declaration of Independence, and was one of the signers.

During the Revolutionary War Franklin represented American interests in Europe, and particularly in France. His scientific reputation, his dignity of character, and charm of manner made him extremely popular in French literary, social, and political circles, and his wisdom and fertility of resource secured for the Government aid and concessions which no other man could possibly have obtained. He lent efficient aid to the operations of the American navy and especially of John Paul Jones. Against the vigorous opposition of Necker, his matchless diplomacy got for a country that was bankrupt and almost hopeless loans amounting to many millions of francs. After the defeat of Burgoyne, Franklin was received officially, and in 1778 he concluded a treaty of offensive and defensive alliance with France. In 1782 he signed the preliminary articles of peace, and the next year (September 3, 1783) he was one of the signers of the definitive Treaty of Paris.

In September, 1785, his request to be allowed to return home was granted by Congress; but he had scarcely reached Philadelphia before he was chosen a member of the Executive Council, and soon afterwards he took the position which now corresponds to the Governorship. In 1787 he was a member of the convention to form a national constitution, and in spite of his advanced age was vigorously active in the proceedings. He was deeply interested in all schemes of usefulness and philanthropy, and one of his last public acts was to sign a memorial to Congress, as president of the Pennsylvania Society for the Abolition of Slavery. The last two years of his life were spent in severe pain of body, but in activity of mind. He died April 17, 1790, and was buried in the graveyard of Christ Church, Philadelphia. Upon his death Congress passed resolutions of mourning, and the National Assembly of France, on the motion of Mirabeau, put on mourning for three days.

Franklin's greatest service to America was undoubtedly due to his skill in diplomacy. His public spirit and devotion were reënforced by powers of mind and wisdom that made him practically unrivaled. To his common sense, sagacity, and industry he added great firmness of purpose, a matchless tact, and a broad tolerance. In science, his electrical discoveries, with the invention of the lightning-rod, are very important, and besides these, many other discoveries and inventions are to be credited to him. His literary reputation rests chiefly on his unfinished *Autobiography,* a book which is an epitome of his life and character, expressed in wonderfully clear and simple style. His newspaper and his almanac were the organs through which he spread his practical morality and wisdom, and they and his letters reflect his distinctively American humor. He was never deliberately an author; all his writing was done with a practical aim, and derives its value largely from the accuracy with which it reflects his character. He was remarkably deficient in poetic imagination and in ability to appreciate the spiritual side of man's nature. For a while during his youth he was a skeptic, and he was never an orthodox Christian; but his attitude when he died was such that to-day he would have been classed with the 'liberal Christians.'

In person Franklin was about 5 feet 9 or 10 inches in height, and well built. His complexion was fair, his eyes gray, and his manners extremely affable and winning. None of his descendants bear his name, the last who did so being William Temple Franklin, who died in 1823. There are many descendants of his daughter, who married a Mr. Bache.

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FRANKLIN, Sir JOHN (1786-1847). An Arctic explorer, born at Spilsby, Lincolnshire, England. His father had intended him for the Church, but giving way to the boy's strong desire to follow the sea, secured for him a midshipman's appointment in the navy in 1800. He was first attached to the *Polyphemus,* with which he served in the Baltic, and took part in the battle of Copenhagen, April 2, 1801. His next service was with the *Investigator,* which, under command of Captain Matthew Flinders, was sent to survey the Australian coast. In this expedition Franklin's aptitude for scientific study first attracted attention, his astronomical and nautical observations being of considerable value. Returning to England, he was assigned as signal officer to the ship-of-the-line *Bellerophon,* in which, in 1805, he participated in the battle of Trafalgar. In 1808 he became a lieutenant, and in 1814 accompanied the British expedition against New Orleans, in the attack upon which he was wounded. Franklin's career as an Arctic explorer began in 1818, with his appointment to the command of the *Trent,* a brig that had been fitted out to accompany Captain Buchan in the *Dorothea* in an attempt to sail to the north of Spitzbergen, and cross the Polar Sea by that route. The attempt proved a failure, but Franklin's scientific knowledge and enthusiastic interest in Polar explorations became known, and in the following year he was placed in command of an expedition, which was destined to cross overland from Hudson Bay to Rupert's Land, and explore the northern coast of the continent eastward from the Coppermine River, acting in conjunction, if possible, with Lieutenant Parry, who was dispatched with two vessels to Lancaster Sound. Franklin's party spent three winters in the north, suffered the greatest privations, traveled over 5500 miles, and added much to the geographical knowledge of the north coast-line of North America. On his return to England he was promoted to the rank of captain, and was elected a fellow of the Royal Society. In 1825 he was off again to the Arctic regions, descended the Mackenzie River to its mouth, near which he wintered, and then dividing his party, sent some of them under Dr. Richardson eastward as far as the Coppermine River, while he himself proceeded along the Alaskan coast westward as far as Point Beechey, in longitude 149° 37′ west. He returned to England in September, 1827. In 1829 he was

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BENJAMIN FRANKLIN
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knighted, and in recognition of his services to geographical science received the honorary degree of D.C.L. from Oxford, and the gold medal of the Geographical Society of Paris. From 1830 to 1833 Franklin commanded the *Rainbow* frigate on the Mediterranean station, and won the appreciation of the Greeks, and a decoration from King Otho for services rendered them during their war of liberation. From 1836 to 1843 Sir John was Lieutenant-Governor of Van Diemen's Land, now Tasmania, and the period of his administration was one of the greatest progress the colony had ever known. On his return to England he found that an expedition was being planned by the Admiralty to make another attempt to discover the Northwest passage. Sir John sought and obtained command of the proposed expedition. It consisted of the *Erebus* and *Terror*, with 138 officers and men, and left England on May 18, 1845, with the intention of sailing direct to Cape Walker, and thence southward and westward in the direction of Bering Strait, as far as the ice and land would permit. The ships were last seen on July 26, 1845, by a Scotch whaler in Baffin Bay. In the summer of 1847, in which Franklin had planned to return, as no word had been received from him, uneasiness began to be felt, and an expedition for his relief was planned in England. When the winter of 1847-48 passed without news from the expedition the uneasiness increased, and in the spring of 1848 began a remarkable series of relief and search expeditions from both England and the United States, numbering thirty-nine all told up to 1857, and involving an expenditure of over a million pounds sterling. In 1854 Dr. Rae, conducting a search party sent out by the Hudson Bay Company, came across the first traces of the ill-fated expedition, but it was not until 1859 that the expedition sent out in 1857 by Lady Franklin (1792-1875), under Captain McClintock, decided the fate of Sir John and his comrades, and at the same time established the fact that he had actually achieved what he had set out for, the discovery of the long sought Northwest passage. From the brief records found by McClintock it was learned that, after ascending Wellington Channel, which separates North Devon and Cornwallis Island to latitude 77° N., and returning by the west side of Cornwallis Island, the ships had wintered, in 1845-46, at Beechey Island, on the southwest coast of North Devon (in latitude 74° 43′ 28″ N.); that in the fall of 1846 an attempt had been made to reach the North American coast by sailing through the channel which separates Prince of Wales and North Somerset Islands, but that progress had been arrested by heavy ice when within twelve miles of the north end of King William's Land, where the party remained all winter, and where on June 11, 1847, Sir John Franklin had died; and that the ships were abandoned there by Captain Crozier and the 105 survivors of the party, who on April 26, 1848, started southward over the ice for the Great Fish River, on the Continent, but never reached their destination. Franklin was promoted to be rear-admiral in 1852, five years after his death. Sir John Franklin published the results of his first two Polar expeditions under the titles *Narrative of a Journey to the Shores of the Polar Sea in the Years 1819-22* (1823), and *Narrative of a Second Expedition to the Shores of the Polar Sea in 1825-27* (with Dr. Richardson) (1828). Consult also: McClintock, *Narrative of the Fate of Sir John Franklin* (London and Boston, 1860); Osborn, *The Career, Last Voyage and Fate of Sir John Franklin* (London, 1860); Beesly, *Sir John Franklin* (London, 1881); Markham, *The Life of Sir John Franklin, and the Northwest Passage* (London, 1891); and Traill, *Life of Sir John Franklin* (London, 1896).

FRANKLIN, Samuel Rhoads (1825—). An American naval officer, brother of Gen. W. B. Franklin (q.v.). He was born in York, Pa., entered the United States Navy as an acting midshipman in 1841, participated in the capture and occupation of Monterey, Cal., during the Mexican War, was assistant professor of ethics and English at the United States Naval Academy in 1854, and in September, 1855, became a lieutenant. During the Civil War he became lieutenant-commander in July, 1862, served in the Western Gulf Blockading squadron in 1863, and later as assistant to Commodore Palmer at New Orleans in 1863-64, and in the spring of 1865 served on the staff of Acting Rear-Admiral Thatcher in Mobile Bay. In 1873 he was promoted to be captain. He was chief-of-staff to Admirals Case and Worden successively; served for a time in the European Squadron; was president of the board of examiners for the promotion of officers in 1877; was hydrographer to the Bureau of Navigation from 1877 to 1880; became a commodore in May, 1881; was superintendent of the Naval Observatory in 1884-85; was promoted to be rear-admiral in January, 1885; commanded the European Station from 1885 to 1887; and in 1887 retired from active service. In 1889 he was one of the United States delegates to, and the president of, the International Marine Conference which assembled at Washington. He published *Memories of a Rear-Admiral* (New York, 1898).

FRANKLIN, William (1729-1813). A Colonial Governor of New Jersey. He was born in Philadelphia, and was a natural son of Benjamin Franklin, who acknowledged him and brought him up in his household. During King George's War, William served in the Pennsylvania line on the Canadian frontier, and became a captain before he was of age. In 1754 he was comptroller of the general post-office, and for a time was clerk of the provincial assembly. Going with his father to England, he was there admitted to the bar (1758), and in 1762 was appointed Governor of New Jersey. Now a Tory, though hitherto a Whig, his time-serving character disgusted the colonists. During the Revolutionary War he remained loyal to England, and was kept under surveillance by the patriots. He gave his word that he would not leave the province; but in consequence of summoning a meeting of the old colonial assembly, he was arrested and sent to Connecticut, and kept a prisoner for two years. In November, 1778, he was exchanged and took refuge in New York. In 1782 he went to England, where he died. His political course caused an estrangement between him and his father, though later they were partially reconciled.

FRANKLIN, William Buel (1823—). An American soldier, prominent on the Federal side in the Civil War. He was born at York, Pa., graduated at West Point in 1843, and for the next three years was engaged in topographical work.

In the Mexican War he accompanied General Wood on his march through Coahuila. He subsequently was assistant professor of natural and experimental philosophy at West Point from 1848 to 1852, and thereafter until the outbreak of the Civil War was engaged on various engineering works of importance, becoming chief of the Construction Bureau of the United States Treasury Department in March, 1861. On May 17, 1861, he was promoted to be brigadier-general of volunteers, in which capacity he served in the first battle of Bull Run, and commanded successively a division and the Sixth Army Corps of the Army of the Potomac in the Peninsular campaign under General McClellan. On June 30, 1862, he was brevetted brigadier-general in the regular service, and on July 4th was promoted to be major-general of volunteers. He subsequently commanded the Sixth Corps of the Army of the Potomac in the Maryland campaign, being in command in the battle of Crampton's Gap, and participating in the battle of Antietam; and commanded the left grand division of the Army of the Potomac in the Rappahannock campaign, participating as such in the battle of Fredericksburg, his conduct in which caused his temporary relief from active service. He then served in the Department of the Gulf, where for some months he commanded the Nineteenth Army Corps, and the troops in western Louisiana, and on April 8, 1864, was wounded in the battle of Sabine Cross Roads. From December, 1864, to November, 1865, he was president of the board for retiring disabled officers, at Wilmington, Del. On March 13, 1865, he was brevetted major-general in the regular army. He resigned from the volunteer service on November 10, 1865, and from the regular army on March 15, 1866. Subsequently he became vice-president of the Colt's Firearms Manufacturing Company at Hartford, Conn., in November, 1865; was president of the board of managers of the National Home for Disabled Volunteer Soldiers from 1880 to 1899; and in 1889 was commissioner-general of the United States to the Paris Exposition.

FRANKLIN, William Suddards (1863—). An American physicist and electrical engineer, born at Geary City, Kan. He graduated at the University of Kansas in 1887. After further studies in Germany and at Harvard University, he was appointed assistant professor of physics at the University of Kansas (1887). From 1892 to 1897 he was professor of physics and electrical engineering at Iowa State College, and in 1897 was appointed to the same chair at Lehigh University. His publications include *The Elements of Physics*, and *The Elements of Alternating Currents.*

FRANKLIN AND MARSHALL COLLEGE. An educational institution under the care of the Reformed Church, established by the union of Franklin College and Marshall College. Franklin College was organized at Lancaster, Pa., in 1787, and named in honor of Benjamin Franklin, one of its benefactors; Marshall College, named after John Marshall, was established by the Reformed Church at Mercersburg, Pa., in 1836, in connection with its theological seminary. In 1853 the two institutions were consolidated at Lancaster under a new charter. The theological seminary is affiliated with the college, as is also a preparatory academy. The value of the college buildings and grounds, including Science Hall, erected at a cost of $70,000, is estimated at $210,000; the endowment is $200,000, and the annual income nearly $30,000. Degrees are conferred in the arts and in divinity. In 1902 the student enrollment was over 300, of whom one-half were in the preparatory department.

FRANKLIN COLLEGE. A Baptist educational institution founded at Franklin, Ind., in 1834. The college offers courses in letters, science, and the humanities, leading to appropriate degrees. The student enrollment in 1902, including the preparatory department, was 200. At the same time the total value of the college property was over $400,000 of which somewhat more than one-half represented productive funds.

FRANKLIN INSTITUTE, of the State of Pennsylvania, for the Promotion of the Mechanic Arts. A learned institution at Philadelphia, Pa., established in 1824 for the purpose of disseminating knowledge of the arts and sciences, and combining in one organization features of the Mechanics' Institutes and of the exclusive scientific societies. The objects of the Institute are attained by means of lectures, reports, a journal, libraries, exhibitions, and school instruction. The lectures, originally giving systematic courses of instruction, now have the object of presenting the latest advances in art and sciences, in the form of popular lectures and of strictly technical discussions before the sections into which the Institute is divided. In 1834 a volunteer committee was formed to examine and report on new machines, inventions, and discoveries. The committee is now elective and consists of 60 members, whose labors have given a notable reputation to the Institute. The publication of a Journal was begun in 1826, and has continued uninterruptedly. It is issued monthly and contains the record of the Institute's work and contributions relating to the growth of science and American industries. The library, devoted exclusively to science and the useful arts, contains about 55,000 volumes, 38,500 pamphlets, besides maps, charts, and photographs. It is the public depository of the Congressional district, and has important collections of American, British, French, German, Swiss, Russian, and Austrian patent records, and complete series of reports on public works. In 1824 the Institute held the first exhibition of American manufactures, and has since held 29 exhibitions, the last in 1899. It grants medals, premiums and certificates for notable inventions. A school of mechanical and architectural drawing was established in 1824 and still exists. There are also night-schools of machine design and naval architecture. A school for instruction in English and ancient and modern languages was established in 1826, and became the model on which the Central High School was founded. It was abandoned when the public high-schools were established. Membership in the institution is open to all persons of legal age on payment of yearly dues. Its building stands at 15 South Seventh Street.

FRANK'LINITE. An iron-black, slightly magnetic mineral with a metallic lustre, consisting of ferric and manganic oxides in combination with ferrous, manganous, and zinc oxides. It crystallizes in the isometric system, but is found both crystallized and massive. In Germany it is also found in the form of cubic crystals, but it occurs chiefly in Sussex County, N. J., at Franklin Furnace, Mine Hill, and at Sterling Hill, being found in veins of limestone in zinc-mines. Owing to the manganese that it contains, it is used as an ore for making Bessemer steel.

FRANKLIN'S TALE, THE. One of Chaucer's *Canterbury Tales*. It narrates the adventures of the faithful Dorigen, as they are recounted in Boccaccio's *Decameron*, in the fifth story of the tenth day, although the franklin claims his story is taken from a Breton lay. The narrator himself is a jolly open-handed ex-sheriff and knight of the shire.

FRANKMARRIAGE (*liberum maritagium*). A species of estate tail existing by the common law of England. It arose where a man, on the marriage of his daughter or other female relative, gave lands to the bridegroom, with a provision limiting the inheritance to the issue of the marriage. It was, therefore, a form of fee tail special. This tenure was called *liberum maritagium*, to distinguish it from other species of estate tail. Four things were necessary to a gift in frankmarriage: (1) That it must be in consideration of a marriage, but it might be as well after as before a marriage; (2) that the woman with whom it is given be of the blood of the donor; (3) that the donees should hold of the donor (hence a gift in frankmarriage by a subject became impossible after the statute *quia emptores*); (4) that the donees should hold for four generations. Therefore a reservation of a remainder to a stranger to take effect within four generations was a void limitation upon a gift in frankmarriage.

FRANK-PLEDGE. An ancient principle of English law, prevailing before the Norman Conquest, whereby the members of every tithing or community of freemen were responsible for the good conduct of each other. This responsibility consisted in every ten men in a village being answerable each for the others, so that if one committed an offense, the other nine were liable for his appearance to make reparation. Should the offender abscond, the tithing, if unable to clear themselves from participation in the crime, were compelled to make good the penalty. This law has been ascribed to Alfred the Great; but it would appear to have been in existence at a much earlier period. Mr. Hallam observes: "The peculiar system of frank-pledges seems to have passed through the following very gradual stages. At first, an accused person was bound to find bail for standing his trial. At a subsequent period, his relations were called upon to become securities for payment of the compensation and other fines to which he was liable; they were even subject to be imprisoned until payment was made, and this imprisonment was commutable for a certain sum in money. The next usage was to make people already convicted, or of suspicious repute, give securities for their good behavior. It is not till the reign of Edgar that we find the first general law, which places every man in the condition of the guilty or suspected, and compels him to find a surety who shall be responsible for his appearance when judicially summoned. This is perpetually repeated and enforced in later statutes during his reign and that of Ethelred. Finally, the laws of Canute declare the necessity of belonging to some hundred and tithing, as well as of providing sureties." (*Middle Ages*, ii. 80.)

The *court of frank-pledge*, or *court leet*, was a court of record held once in the year, within a particular hundred, lordship, or manor, before the steward of the leet. The business of this court was to present by jury all crimes committed within their jurisdiction, and to punish all trivial misdemeanors. This court has practically fallen into desuetude, and the business is discharged by the justices of the peace at general and petty sessions. Originally, the business of the court of frank-pledge was confined to taking securities or free pledges for every person within the jurisdiction; but this practice having fallen into disuse, the court gradually acquired a criminal jurisdiction concurrent with that of the sheriff's tourn. See COURT BARON; COURT LEET; MANOR.

FRANKS, THE. The name borne by a confederation of Germanic tribes which appeared on the lower and middle Rhine in the third century after Christ, and subsequently overthrew the Roman power in Gaul. Though the name is first encountered about the year 240, the individual tribes constituting the confederation were known to the Romans as early as the time of Augustus. Chief among these were the Sali, the Sigambri, the Chamavi, the Bructeri, the Ampsivarii, the Chatti, the Tubantes, the Usipetes, and the Batavi. Their first appearance within the Empire was in the year 253, and as early as the beginning of the fourth century they had established themselves in what is now Brabant. Quite early they became separated into two distinct groups—the Salian Franks, who dwelt on the lower stretches of the Rhine and its affluents, and whose name is supposed to have been derived from the River Yssel (Isala or Sala), and the Ripuarian Franks or Riparii, whose territories lay on both banks of the Rhine along its middle course. The Salian Franks were defeated by Constantine the Great in 306, and by Julian in 358, and became the allies of the Romans, who intrusted to them the defense of the border. During the first decade of the fifth century, the Salian Franks, carried away by the onrush of the other Germanic nations into Gaul, turned upon the Roman provinces, captured Treves, and soon became the masters of a large extent of territory on the Meuse and the Scheldt, acknowledging, however, the suzerainty of the Romans. They fought under Aëtius against Attila on the Catalaunian Fields, in 451, and remained on friendly terms with the Romans till after the fall of the Western Empire.

The real greatness of the Franks dates from the Salian Clovis or Chlodwig (481-511), a descendant of the fabled Meroveus, who in 486 overthrew the Roman patrican Syagrius at Nogent, near Soissons, and ten years later vanquished the powerful confederacy of the Alemanni. The Burgundians, the Visigoths of Aquitaine, and the Ripuarian Franks were likewise subjugated and the limits of the Frankish kingdom were extended from the Pyrenees to Friesland, and from the Atlantic to the Main. Under the influence of his wife, Clotilda, Clovis had accepted Athanasian Christianity in 496, and in his campaigns against the Arian Goths and Burgundians he acted in part as the champion of orthodoxy, thus marking the beginning of the close connection between the Frankish monarchy and the Roman Catholic

Church. After the death of Clovis the kingdom was divided among his four sons. Theuderich ruled at Metz, Chlodomer at Orleans, Childebert at Paris, and Clotaire at Soissons. Thuringia, Burgundy, and Provence were acquired before 558, in which year Clotaire became sole ruler of all the Frankish lands. After Clotaire's death, in 561, the kingdom was again divided among his four sons. Austrasia, with a population predominantly Germanic, fell to Sigebert, who made his capital at Metz; Neustria, comprising part of the Gallo-Roman Provinces, was assigned to Chilperic, with his capital at Soissons; Aquitaine fell to Charibert; Burgundy, with its capital at Orleans, was ruled by Guntram. In 567 Charibert died, and his dominions were divided among his brothers. The period that follows is one of internecine strife among the descendants of Meroveus, marked by the foulest crimes and excesses, and resulting in the decay of the Merovingian power. In the prevailing anarchy the great nobles who had been intrusted with the government of the provinces seized the opportunity to make themselves virtually independent and their offices hereditary. (See BRUNHILDA; FREDEGONDA; MEROVINGIANS.) Clotaire II. in 613 once more reunited the lands of the Frankish Crown; but the kings from this time ceased to exercise any influence, and the real power passed into the hands of the great officers of State, the chamberlain, the keeper of the seal, chief of all the mayor of the place (*majordomus*). This office existed in all three of the Frankish kingdoms, but it was in Austrasia that a powerful family arose which held exclusive possession of the mayoralty for more than a hundred years, ruling as monarchs in fact, if not in appearance. This was the race of the Carolingians (q.v.). Pepin of Landen was *majordomus* of Austrasia under Dagobert II. (628-38), and was succeeded by his son Grimoald, who died in 656. Thirty years of confusion followed, during which the Frankish lands were repeatedly portioned out and reunited, until, in 687, Pepin of Heristal, the Austrasian mayor of the Palace, overthrew the forces of Neustria and Burgundy in the battle of Testry, and thenceforth ruled as the *majordomus* of a united Frankish kingdom. His son, Charles Martel (714-741), extended the frontiers of the kingdom in the east, and in 732 repelled the tide of Saracen invasion in the battle of Tours or Poitiers. Charles's son, Pepin the Short, ruled in conjunction with his brother Karlmann till 747; and after that, alone. In 751 Childeric III., the last of the Merovingians, was deposed, and Pepin ascended the throne with the consent of the Pope. Under Charles the Great (q.v.), the son of Pepin, the Frankish power attained its greatest development. Germans and Latins were united under Charles's sway, which extended from the Ebro to the Eider, and from the North Sea to Croatia and Slavonia. The most powerful monarch in Europe, he became also the secular head of the Church, continuing in this manner the tradition of the old Roman Empire. His coronation as Roman Emperor took place in 800. Charles's successor, Louis the Pious, showed himself unequal to the task of holding together the huge empire which his father had created. Civil strife disturbed the last years of his reign. In 841, the year after his death, his sons, Lothair, Louis the German, and Charles the Bald, fought the decisive battle of Fontenay; and two years later, at Verdun, the Frankish Empire was partitioned among them. (See VERDUN, TREATY OF.) This marks the virtual dissolution of the Frankish monarchy, though Charles the Fat succeeded for a moment (884-87) in reëstablishing the Empire. Its place is henceforth taken by the nations of France, Germany, and Italy.

The rôle played by the Franks in the history of Europe was one of capital importance. Of all the barbarian peoples they showed themselves the most capable of assimilating the Roman culture of the countries which they conquered. Civilized, they became in turn the civilizers of the German stocks which had remained in their homes beyond the Rhine. Charles's campaigns against the Saxons carried Christianity into Northern Germany. The elaborate machinery of government which he set up within the Empire established order and respect for the law in Europe, after such a manner as had not been known since the best days of the Roman Empire. Unlike the absolutism of Rome, however, the Frankish monarchy knew how to reconcile Imperial power with the rights of the subjects, as shown in the retention of the national and local assemblages of freemen or representatives of freemen. Frankish law influenced profoundly the legal systems of all the nations of Western and Central Europe. (See LEX SALICA.) Most important of all, however, was the close connection between the Frankish monarchy and the Catholic Church. The donations of Pepin and Charlemagne and the establishment of a new Roman Empire may be said to have determined the general features of the political history of Europe during the Middle Ages. Consult: Perry, *The Franks* (London, 1857); Sismondi, *The French Under the Merovingians* (London, 1850); Church, *Beginning of the Middle Ages* (New York, 1877); Emerton, *Introduction to the Study of the Middle Ages* (Boston, 1888); Guizot, *History of Civilization* (Eng. trans. New York, 1861); Thierry, *Récits des temps mérovingiens* (Paris, 1882); Favre, *L'empire des Francs* (Paris, 1888); Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (Paris, 1888-89); Arnold, *Fränkische Zeit* (Gotha, 1883); Waitz, *Deutsche Verfassungsgeschichte* (Kiel, 1882).

FRANKS, Sir AUGUSTUS WOLLASTON (1826-97). An English archæologist. He was born in Geneva, Switzerland, and was educated at Eton and at Trinity College, Cambridge. He was long associated with the British Museum as custodian of the department of British and mediæval antiquities and ethnography. During the last five years of his life he was president of the Society of Antiquaries. His knowledge of Oriental ceramics was most extensive, and he gave much porcelain and pottery to the British Museum. In the department of Renaissance art he was also an acknowledged authority. His publications include: *Book of Ornamental Glazing Quarries* (1849); *Examples of Ornamental Art in Glass and Enamel* (1858); *Himyaritic Inscriptions from Southern Arabia* (1863); *Catalogue of Oriental Porcelain and Pottery* (1876-78); *Japanese Pottery* (1880); and *Catalogue of a Collection of Continental Porcelain* (1896).

FRANSCINI, från-shē'nē, STEFANO (1796-1857). A Swiss political economist and statistician, born at Bodio in the Canton of Ticino.

In 1830 he was elected Chancellor of his canton, and he was reëlected in 1844. In 1848 he was elected member of the Federal Council. In his works *Statistica della Svizzera* (1828) and *Statistica della Svizzera italiana* (1837-39) he may be said to have laid the foundation of statistical science in Switzerland.

FRANSECKY, fräns′kĭ, Eduard Friedrich von (1807-90). A German general, born at Gedern, Hesse. He entered the Prussian Army in 1825, and in 1843 was called to the general staff. He fought with distinction in the Danish War of 1848, and in the Austro-Prussian War of 1866, where by his obstinate resistance against powerful odds he helped to decide the engagement at Münchengrätz and also took a prominent part in the battle of Sadowa. As commander of the Second Army Corps during the War of 1870-71, he succeeded, after a forced march, in reaching the battlefield of Gravelotte in time to attack the heights of Point-du-Jour with the First Army, an action which contributed materially toward deciding the battle. On December 1st he received command of the German forces between the Seine and Marne rivers, and on the following day repelled General Ducrot's attempt to break through the lines at Champigny and Brie. He was the chief adviser of Manteuffel in the operations of that general against the Army of the East under Bourbaki, and after numerous engagements compelled the French to retreat into Switzerland. In recognition of his services he received a handsome sum from the Government, and was appointed Governor of Berlin in 1879. He resigned in 1882.

FRANTZ, fränts, Konstantin (1817-91). A German publicist. He was born near Halberstadt, was educated at Halle and Berlin, and after acting as private secretary in the Berlin Foreign Office was attached to the consular service in Spain for three years (1853-56). The central idea expressed in his numerous works is the ultimate and inevitable confederation of Europe, with the Teutonic peoples as a nucleus. The principal works of this gifted writer include: *Der Föderalismus als das leitende Princip für die soziale, staatliche und internationale Organisation* (1879); and *Die Weltpolitik* 1883).

FRANTZIUS, frän′tsĭ-ụs, Alexander von (1821-77). A German explorer. He was born at Danzig, and became established as a physician at Alajuela, and later at San José, Costa Rica, where he made extensive explorations, the results of which he published upon his return to Germany. His works include: *Beiträge zur Kenntnis der Vulkane Costa-Ricas* (1861); *Das rechte Ufer des San Juanflusses* (1862); *Der südöstliche Teil von Costa-Rica* (1869); *San Salvador und Honduras im Jahre 1576* (1873). Several of his works have been translated into Spanish by Cortéz, Carazo, and Twight.

FRANZ, fränts, Julius (1824-87). A German sculptor. He was born in Berlin, and was taught by Wichmann and Fischer at the Academy of Art in that city. After gaining valuable experience in the studios of Fischer, Wredow, Tieck, and Rauch he produced his first important work, "Shepherd and His Dog in Conflict with a Lion" (1851, in the Sanssouci Garden near Potsdam). Many of his works are decorative rather than artistic in character. Among the colossal groups executed by him in sandstone may be mentioned: "America and England" (Berlin Bourse); "Prussia and Hanover," after a design by F. A. Fischer (Belle-Allianceplatz, Berlin).

FRANZ, Robert (1815-92). A celebrated German composer, born at Halle. The family name was originally Knauth, but in 1847 it was officially changed. In spite of the opposition of his parents, Robert early began to study music, and when twenty years of age went to Dessau, where he was for two years a pupil of Friedrich Schneider. Upon his return to Halle he devoted himself to the study of the great masters of music, especially Bach, Handel, and Schubert; but it was not until 1843 that his first collection of songs was published. Schumann, Liszt, and Mendelssohn praised them highly, and this success gained for him a position as organist at the Ulrichskirche. He later became conductor of the Singakademie, and director of music at the university. In 1868 Franz was compelled to resign his positions on account of deafness and ill health, and he was only kept from poverty by a series of benefits given by his friends in Germany and America. His arrangements of some of Handel's and Bach's works are standard, but it is as a song-composer that his fame is assured. His two hundred and fifty-seven songs, which are written for solo voice and piano accompaniment, are similar in style to those of Schumann and of Schubert, and are scarcely excelled by theirs. In addition to his songs he composed a number of sacred works, the best of which are his six chorals. He died in Halle. There are a number of biographical sketches of Franz by Ambros, Saran, Schäffer, Schuster, etc., of special note being that by Waldmann, *Gespräche aus zehn Jahren* (Leipzig, 1895).

FRANZ-DREBER, fränts′ drā′bẽr. See Dreber, Heinrich Franz.

FRANZÉN, frȧn-tsȧn′, Frans Michael (1772-1847). A Swedish author and poet, born at Uleåborg (Finland). While professor at the Academy of Åbo, he published his first volume of poems (1794). After the annexation of Finland to Russia (1809), he lived in Sweden, and became successively pastor at Örebro, and Bishop of Hernösand (1831). He excelled in lyric poetry, particularly religious songs, some of which are accounted among the best in the Swedish language. His works include: *Skaldestycken* (1824-61), *Stamlade Dikter* (1867-69), and *Valda Dikter* (1871), lyric poems; *Gustav Adolf i Tydskland* (1817-18), an incompleted national epic; *Christopher Columbus* (1831); *Emili eller en afton i Lappland; Svante Sture;* and *Lappflickan i Kungsträdgärden.* His *Minnesteckninger* (1848-60), a collection of biographies of prominent Swedes, are models of their kind.

FRANZENSBAD, fränts′ens-bät. A fashionable watering-place in Bohemia, Austria, situated about 1450 feet above the sea, in a somewhat barren, rolling country, four miles northwest of Eger (Map: Austria, C 1). The town is pleasantly laid out with shady streets and charming parks, and is fully equipped as a health resort. It is chiefly famous for its chalybeate and saline springs, impregnated with carbonic-acid gas. They are twelve in number, and are considered especially efficacious for anæmia and diseases of women. The mud baths (*Moorbäder*), formed by mixing warm mineral water with pulverized mineral earth, are employed in cases of rheumatism and skin diseases. Population, in 1890, 2400; in 1900, 2330. The waters of Franzensbad were mentioned as early as the sixteenth century, and the town was founded by Francis I. in 1793.

FRANZENSKANAL, fränts′en-kȧ-näl, or Bácser Canal. A canal of Hungary, since 1801 connecting the Danube and the Theiss. It is 67 miles long, 65 wide, and 6½ feet deep.

FRANZ-JOSEF LAND, fränts′yō′zĕf lȧnt. An Arctic archipelago, north of Nova Zembla, and east of Spitzbergen, lying north of Asia, mainly between latitudes 80° and 82° N., and longitudes 42° and 63° E. (Map: Arctic Regions, G 4). It was discovered in 1873 by the Austro-Hungarian expedition under Weyprecht and Payer, and named in honor of their Emperor. It is a group of about sixty small islands separated by fiords, channels, and sounds. As far as explored, the greatest distance across the archipelago is about 220 miles along the parallel 80½ N., and its greatest breadth is 165 miles along the fifty-ninth meridian. The Queen Victoria Sea lies to the north and west. The western group of islands in the archipelago is called Alexandra Land. Separated by the British Channel on the east, lies the group known as Zichy Land. Still farther east, beyond Austria Sound, lies the Wilczek Land group. Franz-Josef Land is a tableland, generally from 400 to 500 feet above the sea. In numerous places, however, the altitude reaches 1000 feet, and in Wilczek Land about 2600 feet. The surface is formed of basaltic rocks which protrude occasionally through the thick covering of ice and snow. Beneath these layers of rock are strata of soft shales, clay, sandstones, and marl. Fossil plants and animals have been found in these lower strata. Glaciers abound.

The absence of the sun from the middle of October to the last of February sufficiently marks the polar character of the climate. The average temperature in the coldest month is about —20° F., and of the warmest month 35° F. The degree of cloudiness varies from about 50 per cent. in winter to 85 per cent. in summer. Dense fogs often prevail. The winds are chiefly from the east or west, with a marked tendency to blow from the north. Violent gales continue for days at a time. There are magnificent auroral displays. The chief plants of Franz-Josef Land are lichens, mosses, and grass. The willows, heaths, and sedges usually found at even this high altitude in other countries are here lacking. Of flowering plants, the chief are the yellow and white poppy, cresses, Draba alpina, scurvy-grass, Cerastium alpinum, Saxifraga, Alpine foxtail grass, and Poa cenesia. The vascular cryptogams are lacking. Few species of hepaticæ are present, Marchantia polymorpha (the common liverwort of Europe and America) being the most prominent. The mosses in numerous places form thick carpets, with a brilliant coloring of green and yellow and bright crimson. Sea-algæ are rare, but fresh-water algæ are numerous. The lichens grow in profusion up to 600 feet above the sea, and are found at heights of 1000 feet. The variety of mammalian fauna is very limited. Polar bears are relatively plentiful; a few blue foxes are to be seen; walruses are fairly abundant. The saddle-back and ground seals are scarce, but the ringed seals, or 'floe-rats,' are quite common. The avian fauna has been carefully studied. It includes the snow-bunting, eider-duck, purple sandpiper, various gulls (the glaucus, kittiwake, and ivory), Richardson's skua, Brünnich's and black guillemots; and the little auk, Brent goose, snowy owl, and Arctic tern. Only half a dozen species of insects have been found.

Franz-Josef Land has been very prominent in the later history of Arctic explorations. It was near Cape Flora that Nansen and Jackson met on June 17, 1896. Wellman was in Franz-Josef Land in 1899; the Duke of the Abruzzi and Prince Amadeus of Savoy explored in this region in 1899-1900; and Cagni reached from here the highest point north that had been made by the end of the nineteenth century. Consult: Weyprecht, *Sulla spedizione polare austro-ungarica* (Triest, 1875); Payer, *New Lands Within the Arctic Circle* (Eng. trans. London, 1876); Greely, *Handbook of Arctic Discoveries* (New York, 1896); Jackson, *A Thousand Days in the Arctic* (New York, 1899). See Arctic Region and Polar Explorations.

FRANZOS, frȧn-tsōs′, Karl Emil (1848—). A German journalist and novelist of Jewish descent, noted for his pen pictures of Eastern European life. He was born in Podolia, October 25, 1848. His first volume, *Aus Halb-Asien* (1876), won European success for its brilliant descriptions of life in Galicia, Rumania, and Southern Russia. It was translated into several languages. This was followed by *Vom Don zur Donau* (1878), and many stories, usually of the same scenes that maintained his reputation. Of these the more noteworthy are: *Die Juden von Barnow* (1879); *Ein Kampf ums Recht* (1882); *Tragische Novellen* (1886); and *Der Wahrheitsucher* (1894).

FRAPAN, frȧ′pän′, Ilse. The pseudonym of the German novelist and poet Ilse Levein (q.v.).

FRAPOLLI, frȧ-pôl′lē, Lodovico (1815-78). An Italian patriot and diplomat, born at Milan. He was forced to enter the Austrian Army in 1831, but left it as soon as he came of age. In 1840 he went to France and studied at the School of Mines. He wrote on the origin and formation of the earth, and on the geology of Finisterre and of the Scandinavian countries and Germany, and was made secretary of the French Geological Society. He took part in the fighting at Paris in February of 1848, and later in the year went to Milan, and held office in the War Ministry of the Provisional Government in Lombardy. Then he was Ambassador in Paris of Lombardy, Tuscany, and the Roman Republic in quick succession, but left the French capital after the capture of Rome; lived in Switzerland, and devoted himself to geology. He was Minister of War under Farini in Modena, but retired, and in 1860 joined Garibaldi's expedition to Sicily, and entered Naples with him. He was an Italian Deputy from 1860 to 1874, an extreme member of the Republican Party. He was a leader in the Italian society of Free Masons, and became Grand Master in 1869. In 1870 he again fought under Garibaldi.

FRAS, frȧs, Jakob. See Vroz.

FRASCATI, frȧs-kä′tē. A beautiful summer resort in Central Italy, 985 feet above the sea, on the north slope of the Alban Mountains (q.v.), 15 miles southeast of Rome (Map: Italy, M 2).

It is the residence of a cardinal bishop, and has two churches that were mentioned in monastic records as early as the ninth century. In the Cathedral of San Pietro, dating from 1700, is a memorial tablet to Charles Edward Stuart, the Young Pretender of England, whose body, buried here in 1788, now lies in Saint Peter's. Famous estates are the Villa Conti; the Villa Piccolomini, where in the sixteenth century Cardinal Baronius wrote his *Annales;* the Villa Aldobrandini, built by Giacomo della Porta for Clement VIII.'s nephew, which contains paintings by the Cavaliere d'Arpino; and the sixteenth-century Villa Tusculana or Ruffinella, the property once of Lucien Bonaparte and afterwards of Victor Emmanuel II. Frascati first became important after the destruction of Tusculum (q.v.) in 1191. Population of commune, in 1881, 7500; in 1901, 9915.

FRA'SER, Alexander Campbell (1819—). A Scottish philosopher. He was born in County Argyll, was educated in Edinburgh University, and from 1846 to 1856 was professor of logic in New College, Edinburgh. After contributing extensively to the *North British Review*, he became the editor in 1850, and held the position until 1857. In 1856 he succeeded Sir William Hamilton as professor of logic and metaphysics in the University of Edinburgh. Professor Fraser's philosophical work treats the three great problems—the material world, man, and God—in their mutual relations. The first is discussed in his *Collected Edition of the Works of Bishop Berkeley, with Annotations and Dissertations* (1871), and in a *Biography of Berkeley* (1880); the second in his *Annotated Edition of Locke's Essay on the Human Understanding, with Prolegomena Critical and Historical* (1894); and the three in his collected lectures on the *Philosophy of Theism* (1896) and his *Biography of Thomas Reid* (1898). He steers a middle course between extremes of agnosticism and idealism by a practical faith in the divine order of a universe incompletely interpretable.

FRASER, Alexander Mackenzie (1756-1809). A British general. He was educated at Aberdeen, and after a few years in the banking house of Forbes and Company, in Edinburgh, accepted (1778) a commission in the Seventy-third Highlanders. He served in the defense of Gibraltar, and as recruiting officer; and retired from the army in 1784, when he married Helen Mackenzie. In 1793 he was commissioned major in the Seventy-eighth Highlanders. He was sent to Guernsey, and in the following year to Flanders; covered Abercrombie's retreat, and distinguished himself in the sortie from Nimeguen and at Geldermalsen (1795). In 1796 he served at the Cape of Good Hope, and a year later went to India, where he campaigned against the Mahrattas. When he returned to England, he was elected to Parliament, and received the grade of major-general (1802). In the next year he inherited property from his aunt and mother, and took the name Fraser in addition to his own. After service in England, Hanover, and with Henry Edward Fox (q.v.) in Sicily, he was chosen by Fox to command an expedition to get control of Egypt; but fared very badly at Rosetta, after capturing Alexandria, and had to return to Sicily. Sent to Portugal (1808), he advanced with Moore into Spain; showed great military ability in the retreat through Galicia and at Corunna; and was made lieutenant-general. In the following year he sickened while on the Walcheren expedition, and died soon after his return to England. He was popular as well as able.

FRASER, Charles (1782-1860). An American artist. He was born in Charleston, S. C. He practiced law for ten years to acquire the means of continuing his art, and eventually was very successful as a miniature painter. He painted Lafayette's portrait in 1825, and the portraits of many prominent citizens of South Carolina, and also produced some landscape and genre pictures. He wrote *Reminiscences of Charleston* (1854), and contributed to various periodicals.

FRASER, Donald (1826-92). A Scottish minister, born at Inverness. He graduated at the University of Edinburgh in 1842, and after studying theology at Knox College, Toronto, and at New College, Edinburgh, held pastorates in Montreal, Inverness, and at the Marylebone Presbyterian Church, London (1870-1892). His works include: *Synoptical Lectures on the Books of the Holy Scriptures* (1871-76); *The Church of God and the Apostasy* (1881); *Life of Thomas Chalmers* (1881); *The Speeches of the Holy Apostles* (1882); *Seven Promises Expounded* (1885); and *Sound Doctrine* (1892).

FRASER, Mary Crawford (Mrs. Hugh). An English author, the daughter of Thomas Crawford the sculptor, and sister of Marion Crawford the novelist. She was born in Rome; was educated in England and in Rome; married Hugh Fraser, afterwards Minister to Japan; traveled with her husband in the two Americas and in the East; and was received into the Roman Catholic Church in 1884. Mrs. Fraser's finest literary work has been in interpreting the new Japan, the beauty of the land and the sense of beauty in its people. In 1899 she published an account of her observations in *A Diplomat's Wife in Japan* and five stories, called *The Customs of the Country, or Tales of New Japan.* With like sympathy and charm of style she has depicted Devonshire life in *A Chapter of Accidents* (1897), and modern Roman society in *The Splendid Porsenna* (1899).

FRASER, James (1818-85). An English prelate, born at Prestbury, Gloucestershire. He was educated at Lincoln College, Oxford; from 1840 to 1860 was fellow of Oriel, where he was tutor in 1842-47 and sub-dean and librarian in 1844-47, and from 1847 to 1860 was rector of Cholderton, Wiltshire. In 1858 he received the appointment of assistant-commissioner to the Royal Commission on Education, and in that capacity made in 1859 a valuable report on the district assigned to him. He was rector of Ufton Nervet, Berkshire, from 1860 until 1870, and greatly developed that parish; in 1865 visited the United States and Canada as a commissioner on education; rendered a second noteworthy report in the year following (*Report on the Common School Systems of the United States and of the Provinces of Upper and Lower Canada*, 1866); and in 1870 was consecrated Bishop of Manchester. His administration of this diocese, undertaken amid very grave difficulties and carried on with remarkable activity, resulted in the establishment of one hundred and nine new district parishes, the consecration of ninety-nine new churches, and the introduction of an admirable system of machinery for diocesan work. At the same time, his interests were so wide as to gain the esteem of all Nonconformists, including the Greek and Jewish congregations at Manchester, and to obtain for him the familiar title of "bishop of all denominations." Theologically he was of the old High Church school and opposed to the Tractarian movement. In his charities he was liberal. He published nothing beyond his reports as Parliamentary commissioner and a few addresses and sermons. A volume of his sermons, under the editorship of J. Doyle, appeared in 1888. Consult: *Memoir* by Hughes (1887); also Arnold, *Our Bishops and Deans*, vol. ii. (1875).

FRASER, SIMON. See LOVAT, twelfth Lord.

FRASER, SIMON (c.1729-77). An English soldier. He was a subaltern officer in one of the two battalions of the Earl of Drumlanrig's regiment that had been in the Dutch service for some time previous to 1749, and in that year was pensioned upon the reduction of the two battalions to one. In 1757 he was appointed a captain-lieutenant in the Second Highland Battalion (later the Seventy-eighth Highlanders), and was soon after promoted to the rank of captain. He was present at the siege of Louisburg and at the action at Quebec. He afterwards served in Germany, at Gibraltar, and in Ireland, and rose to be lieutenant-colonel of the Twenty-fourth Foot. With the rank of brigadier for America, he accompanied Burgoyne in the pursuit of the American forces retreating from Fort Ticonderoga under the command of Saint Clair, and at Hubbardton (July 7, 1777) he won a complete victory over them. He participated also in the first battle of Saratoga (September 19), and in the second (October 7) was mortally wounded.

FRASER, THOMAS RICHARD (1841—). An English physician, born at Calcutta, and educated at the University of Edinburgh, where he graduated in medicine in 1862. He was assistant physician in the Royal Infirmary, Edinburgh (1869-74), a member of the Admiralty committee on Sir George Nare's Arctic expedition in 1876-77, and in 1877 became professor of materia medica at Edinburgh, and of clinical medicine in the year following. He was dean of the faculty of medicine from 1880 to 1900, and was president of the Indian Plague Commission. He became an authority on the action of poisons. His more important scientific writings include: *An Investigation Into Some Previously Undescribed Tetanic Symptoms Produced in Cold-blooded Animals* (1867-68); *An Experimental Research on the Antagonism Between the Action of Physostigma and Atropia* (1870); *The Character, Action, and Therapeutic Uses of Physostigma* (1883), a work which won him the Cameron Prize at the University of Edinburgh, and the Barbier Prize from the Academy of Sciences, Paris; and the *Dyspnœa of Bronchitis and Asthma* (1887).

FRASER, Sir WILLIAM (1816-98). A Scottish genealogist, born in Kincardineshire. He became deputy keeper of the records at Edinburgh in 1880. In this capacity he obtained access to the valuable material which enabled him to prepare his numerous genealogical works, which though somewhat dry in style are of high importance to the student of Scottish history. Fraser was distinguished for his numerous charities, and left more than £60,000 for educational and benevolent purposes. Among his rather voluminous genealogies and histories may be mentioned: *History of the Carnegies, Earls of Southesk* (2 vols. 1867); *The Chiefs of Colquhoun and Their Country* (2 vols. 1869); *The Lennox* (2 vols. 1874); *The Douglass Book* (4 vols. 1885); and *The Elphinstone Family Book* (2 vols., 1897).

FRASER, Sir WILLIAM AUGUSTUS (1826-98). An English politician and author. He was born in 1826, the eldest son of Col. Sir James John Fraser, who fought at Waterloo, and was educated at Eton and at Christ Church, Oxford, graduating B.A. in 1849. Entering the army two years before receiving his degree, he rose to a captaincy in 1852, but resigned his commission and entered Parliament in the Conservative interest. He represented Barnstaple (1852 and 1857), Ludlow (1863), and Kidderminster (1874-80). In 1862 he was elected a fellow of the Society of Antiquaries, and subsequently was a member of the Queen's bodyguard for Scotland. Fraser became famous in London society for his stories and anecdotes concerning Wellington and Disraeli. He published: *Words on Wellington* (1889); *The Waterloo Ball* (1897); *Disraeli and His Day* (1891); *Hic et Ubique* (1893); and *Napoleon III.* (1896). He died in 1898. By his will he left a valuable collection of Gillray's caricatures to the House of Lords and a like collection of Doyle's caricatures to the House of Commons. His library was sold at auction for above £20,000.

FRA'SERA. A genus of North American plants of the order Gentianaceæ, named after John Fraser, an English botanist. The species are strong-growing, single-stemmed, usually biennial herbs, with thick bitter roots, opposite or whorled leaves, and bluish, white, or yellowish, generally spotted flowers in cymose clusters. They are rarely seen in cultivation.

FRA'SERBURGH. A seaport in Aberdeenshire, Scotland, on a branch of the Great Northern Railway, 42 miles north of Aberdeen (Map: Scotland, G 2). It is the chief seat of the Scotch herring fishery, and besides cured herrings and cod, exports oats, barley, meal, and potatoes. It has three tidal harbors, and its shipping includes 14 sailing vessels, 8 steam vessels, and a fleet of 700 fishing-boats. The town possesses a handsome cross, town hall, and spacious customhouse; the streets are wide and clean, with substantial dwellings. Its site is immediately south of Ptolemy's *Promontorium Tæxalium*, now Kinnaird Head, on which stands Fraser's ancient castle, utilized as a lighthouse, with its mysterious wine-tower and a cave beneath. Population, in 1891, 7466; in 1901, 9000, with a large increase during the fishing season in July and August.

FRASER RIVER. The principal stream of British Columbia, comprising in its basin of 138,000 square miles the greater part of the province (Map: British Columbia, E 4). The Fraser River proper has its origin in the union of two branches, the more important of which receives its waters from a series of lakes that lie in latitude 54° to 55° N., longitude about 124° 50′ W., and flows in a general southeast direction for 260 miles, where it unites with the other branch, 200 miles long, which has its source near Mount Brown, in the Rocky Mountains. The point of confluence is near Fort George, and thence the Fraser River flows in a generally southerly direction through nearly the whole length of the province, and, after a total course of 740 miles, empties into the Gulf of Georgia between Vancouver Island and the mainland, just north of the international boundary of 49° of latitude. Its chief affluents are the Stuart and the Chilcoten on the right, and the Thompson on the left. Between the Stuart and the Chilcoten, and on the same side, the Fraser River is joined by an affluent of historical interest—the West Road River—which took its name from its having been ascended by Sir Alexander Mackenzie on his adventurous journey of 1793 from the Hudson Bay territories to the Pacific Ocean. The Fraser River is navigable for small and powerful steamboats as far as Fort Hope, and at high water to Yale, 190 miles from its mouth, while to about half that distance—as far as New Westminster—it is navigable for large ships. Above Fort Hope the river sweeps through Big Cañon, which is traversed from Lytton downward by the Canadian Pacific Railway. From April to August the river is subject to floods, caused by the melting snow on the mountain ranges. In the narrow mountain valleys the river rises as much as 60 feet above its normal height, and in the lower valleys covers 150,000 to 200,000 acres of rich land. The Canadian Government has under consideration a comprehensive engineering plan of dams and dikes to mitigate this evil.

In 1857 the Fraser River, in its auriferous diggings and washings, began to stand forth as the rival of California and Australia. The discoveries, originally confined to the lower basins, have become more extensive and more productive, and eastward on the Thompson and northward among the upper waters of the great artery of the country the precious deposit has sometimes given almost fabulous returns. After 1862 washings and surface diggings were succeeded by systematic mining and steady labor. The Fraser River, its tributaries, and the numerous lakes communicating with them, furnish great facilities for the transport of timber. The lower Fraser country especially is densely wooded. The salmon of the Fraser River, of which there are five species, are justly famous, and the fishing and canning industries are of considerable importance. The river takes its name from Simon Fraser, who, in spite of the hostility of Indians and the natural difficulties to be overcome, explored it to its mouth in 1808.

FRASER RIVER SALMON. A species of salmon (*Oncorhynchus nerka*), called 'blueback,' 'redfish,' etc., which is the most common and valuable one in and near the Fraser River, B. C. See Salmon; Redfish; Plate of Salmon.

FRA′SERVILLE, or **RIVIÈRE DU LOUP**, rė′vyâr′ dụ lo͞o (en Bas). A town, summer resort and important railway centre of Temiscouata County, Quebec, Canada, picturesquely situated on elevated ground at the confluence of the Rivière du Loup with the Saint Lawrence, 125 miles northeast of Quebec (Map: Canada, R 7). It is on the Intercolonial Railway, and is the terminus of the Temiscouata Railway. It has the Fraser Institute and other educational establishments, and carries on a considerable general trade. It is much frequented for its shooting, angling, boating, bathing, and its scenery. Population, principally French-Canadian, in 1891, 4175; in 1901, 4569.

FRASIER, frā′zhẽr (OF., Fr., strawberry-plant, from *fraise*, strawberry, from Lat. *fragum*, strawberry-plant). In heraldry, a strawberry-flower appearing in the arms of the Scotch family of Fraser, as identical with a cinquefoil. See Heraldry.

FRAT′ERET′TO. One of the evil spirits by which Edgar pretends to be possessed during his mad scene in the third act of Shakespeare's *King Lear*. The name of this demon, as well as of some others in the same act, Shakespeare took from a book by Dr. Samuel Harsnet on *Popish Impostures*, published in 1603. In this Harsnet says: "Frateretto, Fleberdigibet, Hoberdidance, Tocobatto, were four devils of the round, or Morrice, whom Sara in her fits tuned together, in measure and sweet cadence. These four had forty assistants under them, as themselves do confess."

FRATERNAL INSURANCE. The characteristics which distinguish fraternal insurance from other forms are not to be sought in any peculiarity of the insurance itself, but rather in the nature of the body which grants it. There is no single feature of fraternal insurance which is not to be found in other systems of life insurance. Fraternal insurance is insurance granted by a 'fraternal beneficiary' society or order to its members. The essentials of such a society, as laid down by the National Fraternal Congress, are, that it should be organized in a system of lodges, that it should have a ritual and a representative form of government, that it should pay benefits, and should not conduct its business for profit. Such societies have almost invariably collected their premiums by means of assessments; but the assessment principle is not essential to their business, and on the other hand its use is by no means confined to such organizations. A great deal of undeserved odium has attached to fraternal insurance societies owing to the failure to discriminate between them and commercial assessment companies. The history of the latter is for the most part a record of inefficiency or dishonesty on the part of the managers and credulity on the part of the members, ending in a large proportion of cases in financial disaster.

History. The early American fraternal societies were established somewhat on the lines of the English friendly societies, several of which founded branches in the United States during the first half of the nineteenth century. Both the English and the early American societies paid benefits of various kinds, often including funeral benefits and payments to the survivors of the deceased members, but none of them established a system of payments deserving the name of life insurance. The first person in the United States to recognize the possibilities of developing on a large scale coöperative relief in the form of death benefits or life insurance through a system of affiliated lodges was John Gordon Upchurch, who founded in 1868 the Ancient Order of United Workmen. This society is still in existence and contained in 1902 420,000 members. Several other benefit societies, organized on the lodge system, were established during the next decade. Some of these introduced the insurance feature at once, led to it by the high rates charged by the old-line companies and the harsh provisions of their policies. A more powerful impetus toward the introduction of insurance into such societies came in the seventies, when more than sixty legal-reserve old-line companies failed, creating a feeling of distrust and hostility toward them. Under the influence of this feeling fraternal societies already established introduced the insurance feature, new societies providing for it were formed, and nonfraternal assessment insurance companies appeared in large numbers. In the decade 1881-90, many additional fraternal insurance companies were organized. The eleventh census reported that on December 31, 1889, there were in the United States 298 such orders with 40,342 subordinate lodges. Owing to unsound financial methods, the term of life of many of these orders was very short, so that, in spite of the founding of many new orders, since 1890 there has probably been no increase in the total number in existence.

It is impossible to compile a complete list of existing fraternal insurance societies, or to collect full statistics about them, since in many States they are exempted from the duty of making reports to the Insurance Department. Many of the largest companies, however, are federated in the National Fraternal Congress, and for these companies it is possible to obtain complete statistics. In December, 1900, the congress included 47 orders, with 2,855,774 benefit members. The net gain in members for the year had been 327,513. The protection in force at the end of the year was $4,585,579,982, and the net gain for the year $401,952,932. It is probable that other orders not affiliated with the congress had approximately 1,000,000 members, with at least $1,000,000,000 insurance in force. It is interesting to note that on the same date, December 31, 1900, the old-line life insurance companies reporting to the New York Insurance Department—companies which carried at least 95 per cent. of the life insurance in force in old-line companies in the United States—had policies in force amounting to $4,076,283,539.

Organization and Activities. The forms of organization of the fraternal orders are various. Their government is representative, and is vested in a supreme body consisting of an executive head and certain official associates. In some orders State lines are observed and State officers exercise immediate jurisdiction in many matters over the local lodges in the State. While nominally subordinate to the general body, they are more or less masters of the order in their own territory. Some orders have no intermediate State organization; the local associations are directly affiliated with the supreme body. The Ancient Order of United Workmen may be cited as an illustration of the former class, the Independent Order Sons of Benjamin of the latter. The activities of the different orders are also very various. It is unnecessary to speak of the social features which constitute so important a part of their life. These are entirely under the control of the local bodies, and manifest little approach to uniformity. In the matter of benefits also there is very great diversity. Some of the societies give only death benefits; others give benefits of many other kinds, such as disability, accident, sickness, burial, and monument benefits. These miscellaneous benefits are usually supported and managed by the local lodges. The death benefits, on the other hand, are usually under the control of the supreme national body; in a few orders they are maintained by the general State organization. Three federations of fraternal beneficiary associations have been formed: the National Fraternal Congress, the American Fraternal Congress, and the Associated Fraternities of America. The National Fraternal Congress was formed at a meeting held in Washington in 1886, at which delegates from 17 orders were present. The orders represented at the congress of 1901 numbered 47. In the constitution the objects of the congress are "declared to be the uniting permanently of all legitimate fraternal benefit societies for the purposes of mutual information, benefit, and protection." In recent years it has devoted a large part of its time and energy to the attempt to accomplish two objects. The first is the voluntary increase of assessment rates by the affiliated orders for the purpose of accumulating reserves, or, as they prefer to call them, emergency funds; the second is the securing of uniform legislation by the various States on matters affecting fraternal insurance. Some of the specific measures advocated by them will be referred to later on.

The American Fraternal Congress was organized at Omaha, Neb., in 1898, by representatives of 18 fraternal orders. The purpose of this organization was to work for the establishment of reserve funds by the fraternal societies. No society without a reserve fund was eligible to membership. The National Fraternal Congress has done so much work along the same line that the more recent federation has little occasion to act and has not become very prominent. The Associated Fraternities of America was organized at Chicago in 1901 by representatives of the younger fraternal orders in opposition to the National Fraternal Congress. Forty-two societies were represented at the meeting. The first annual meeting was held in July, 1901, 24 associations being represented. The point of conflict between the two organizations will become apparent on considering the nature of the legislation sought by the National Fraternal Congress. It is in brief the enactment of a minimum assessment rate for all fraternal insurance organizations. The purpose is to prevent the appearance of new companies with low assessment rates to draw away the 'new blood' from the old established companies, in which the advancing death-rate has made necessary an increase in assessments in order to pay losses. Such legislation the younger orders naturally resist.

Technique. Assessment insurance was organized largely in protest against the methods of the old-line life insurance companies. It was generally believed that the cost of insurance in those companies was unnecessarily high. A reduction in cost was anticipated from two sources. In the first place, it was proposed to reduce the expense of management to a minimum, and in this way to cut down the heavy 'loading' which the old-line companies added to the natural premium. In the second place, it was proposed to do away with the enormous surpluses which the old-line companies were held to be continually accumulating and never paying out. "Pay your losses as they occur and keep your reserve in your own pockets," was the maxim of the advocates of the assessment principle. No financial craze recorded in history has affected more people, or people with sounder judgment in ordinary business matters, than did the assessment craze. Its culmination was reached in the establishment of a large number of assessment endowment societies, which guaranteed to every member a certain stipulated sum at the end of a fixed period of time in return for a number of periodical payments to the company. The Iron Hall was the first and most notorious of these associations. This organization virtually promised its members that in consideration of the annual payment to the society for seven years of 18 assessments of $2.50 each, making a total contribution of $315, each member should receive from the society $1000 at the end of the seven years. For a few years such payments were actually made, the endowment of the early members coming out of the contributions of the new members. Only by a steady increase of membership at a continually increasing geometrical ratio could such a system be maintained. The Iron Hall and all its imitators came to grief within a few years, bringing loss upon millions of people in the United States.

The assessment life-insurance companies were managed on no sounder principles than the assessment endowment societies. At the beginning all of them, whether fraternal or non-fraternal, raised their funds by assessments after the death for which indemnity was to be paid. In the early days of an assessment company, while the average age of the members was low and the benefit of medical selection was still felt, these assessments were very small. Knowledge of the scientific principles of life insurance was not to be found among the promoters of these companies. The need of mortality tables and the desirability of accumulating a surplus during the earlier years to prepare for increasing mortality were both denied. It was the general claim that the continual accession of new members would prevent any advance in the average age of the members or in the death-rate. This might have been the case if a company had been started with a membership whose age distribution was properly related to a sound mortality table. It could not possibly be the case in a company which started, as all these companies did start, with a great preponderance of young members. In such a company it is clear on *a priori* grounds that the average age of members must increase. Experience soon demonstrated the same fact. The average age of members and the death-rate increased, and the inevitable increase in the rate of assessment kept new members out of the society, and on the other hand the lapse rate continually advanced, through the withdrawal of members who were unwilling to pay the increased assessments, or desired to join new societies in which the average age, death-rate, and assessments were still low. The vast majority of non-fraternal assessment societies and a large number of fraternal associations were in this way forced out of business.

The greatest enemies of an old established fraternal insurance society are unreasonable expectation created by unjustifiably low rates at the beginning, and new companies with low mortality and small assessments. Realizing this fact, the old societies which are federated in the National Fraternal Congress have adopted two lines of action to protect themselves. In the first place, they have undertaken a campaign of education among their own members. Year after year they analyze the returns of the constituent orders, and point out the inevitable advance from year to year in average age, in death-rate, and in cost of insurance, as well as the tendency of the members to desert the old companies and flock to the new. A comparison of the average annual death-rate in different years for the entire congress has no significance, since old companies with a high death-rate are continually passing away and new companies with low death-rates coming in. At the meeting of the congress in 1899 the report of the committee on statistics pointed out that while the average death-rate for the whole body was 8.65 per 1000 in 1898, as compared with 9.32 in 1897, if allowance was made for the influence of the new orders in lowering the rate (it was impossible to make allowance for the similar effect of the withdrawal of the older orders), the figures would be 8.87 in 1897 and 8.89 in 1898. The committee also compiled the death-rates for 21 companies for each of ten years. In 1888 the average had been 7.22, in 1893 9.34, and in 1898 10.84. As to the effect of these changes upon membership it was shown that of the 46 orders reporting that year 19 had a death-rate above the average for the group, and 27 a rate below the average; that the 19, with a membership at the beginning of the year of 869,862, had made a net gain during the year of only 2415; and that the 27, with a membership at the beginning of the year of 1,192,811, showed a net gain of 217,282. The rate of gain in the former group was 0.28 per cent., and in the latter 18.26 per cent.

In a similar way the committee demonstrated that average age and cost of insurance both increase as the society grows older. Thoroughly aroused by such revelations, the congress authorized the appointment of a committee to prepare tables of rates by applying to a proper extent the principles of a reserve or an emergency fund. This committee first prepared a new mortality table, after investigation which convinced it that the tables of mortality in use by the old-line companies were higher than experience justified. The divergence between the old tables and the new ones is brought out by the following comparison of the death-rate per 1000 living at different ages:

AGE	American experience table	Fraternal table	AGE	American experience table	Fraternal table
20	7.81	5.00	60	26.69	22.75
25	8.07	5.20	65	40.13	34.40
30	8.43	5.55	70	61.99	53.65
35	8.95	6.15	75	94.37	85.48
40	9.79	7.17	80	144.47	138.10
45	11.16	8.88	85	235.55	225.10
50	13.78	11.45	90	454.55	368.95
55	18.57	15.71	95	1000.00	606.78

While the mortality experience of every old-line life-insurance company which exercises due care in the selection of its risks shows a rate of loss below that indicated by the American Experience Table, the degree of difference between the two tables here outlined gives reason to think that the Fraternal Table is very close to the margin of safety. At the same time it is a great advance over no table at all, and experience will soon test its validity.

On the basis of the new mortality table, and on the assumption that the reserve will earn four per cent. interest, the committee prepared several tables of minimum rates. Besides the level annual rate, such as is commonly used by old-line companies for whole-life policies, the committee prepared a table of rates peculiar to the fraternal and assessment societies, the so-called step rate. The step rate advances with advancing age, but not from year to year as the natural premium rate does, but at stated intervals, usually every five years. By a modification of the step-rate plan a slight addition is made to the premium rate during the earlier years, in order to make possible a reduction of the rate in old age. All the rates prepared by the committee presuppose the abandonment of the system of assessing after the occurrence of the loss and the accumulation of a surplus at least for one year. The congress has urged its members to adopt as minimum rates those prepared by the committee, with such loaning for expenses as each association finds necessary. Some organizations have done this, but the extent to which changes have been introduced is very unequal. The result is a high degree of diversity of rates. At the National Congress for 1899 there was exhibited a table of rates actually charged for the same kind of insurance at the same age in different fraternal societies. At age fifty, for example, no less than 41 rates for the same protection were in force in different companies, varying by moderate differences from a minimum of 65 cents to a maximum of $3.80.

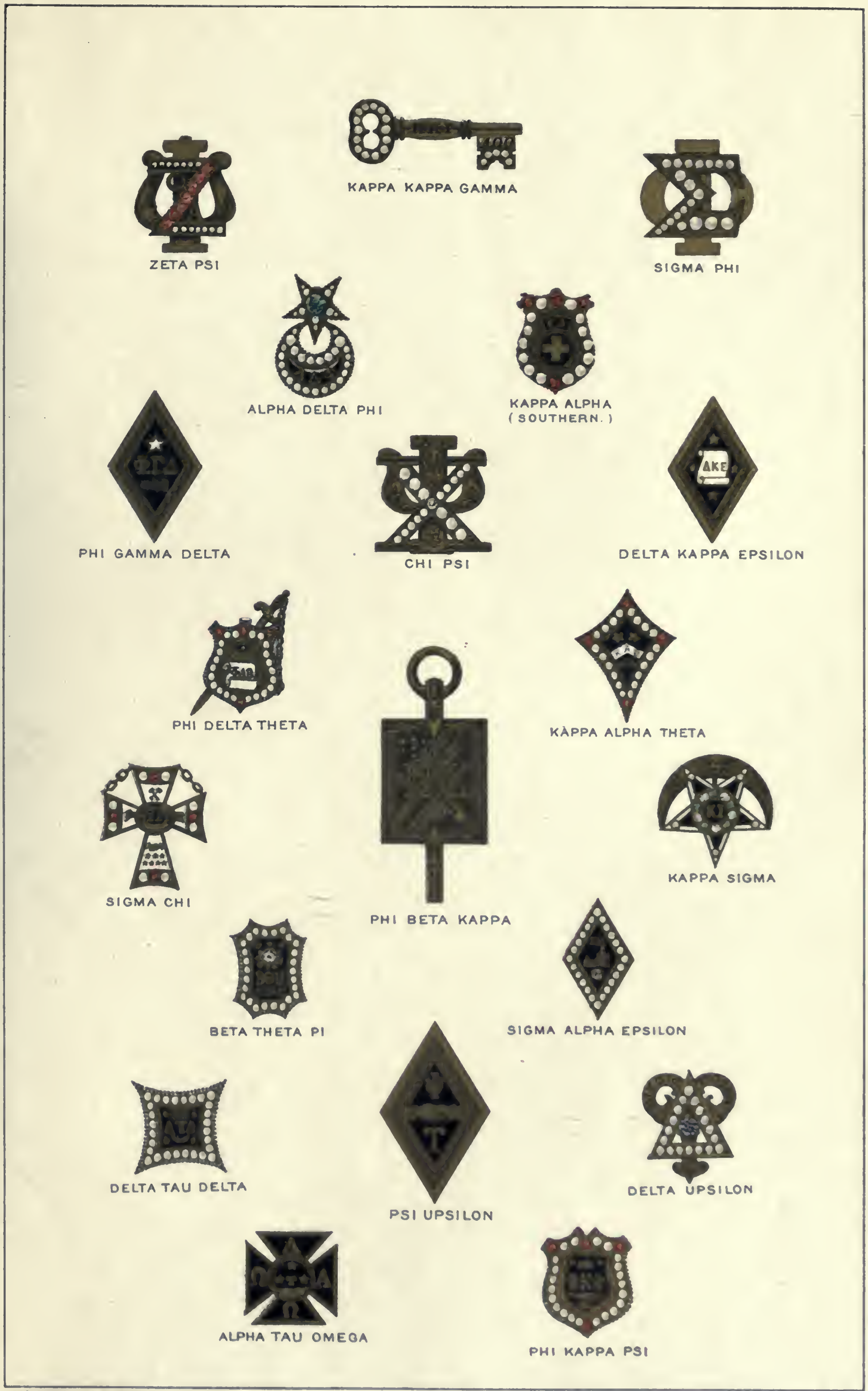
Despairing of its ability to secure the adoption of the new rates through the voluntary action of the orders, and dreading the effect of the competition of new orders with low rates, the congress has begun the attempt to secure the adoption of these rates through legislation. In the session held in 1901, the president reported that legislation requiring the establishment of these minimum rates as conditions of doing business in the State had been secured in five States, viz. North Dakota, Tennessee, Washington, Vermont, and Indiana. Similar legislation will doubtless be secured soon in other States. Whether the low rates thus established will be found high enough to maintain the companies permanently in a sound financial position it is impossible to say.

Rates in the fraternal companies can be legitimately kept below rates in the regular companies in only two ways: either by making such a selection of lives that the rate of mortality is lower in the former than in the latter, or by keeping expenses of management below those of the old-line companies. To a greater or less extent both these aims are accomplished. There can be no doubt that the close personal scrutiny which every individual undergoes before being admitted to a lodge is a valuable supplement to the medical examination. If it is found that the mortality schedule adopted is sufficiently high, rates may legitimately be put below the old-line level. Moreover, the expense of management in the fraternals is reduced to a minimum. Not to speak of the large amount of gratuitous service rendered by the members of many associations, the entire absence of agents for soliciting business is a source of great economy to the companies. The amount paid agents by the old-line companies is approximately one-third of the amount paid to policy-holders. It is clear, therefore, that there are great opportunities for economy by the fraternal companies, and it may fairly be expected that those among them which take to heart the lessons of experience and put their business on a sound basis so far as the matter of surplus is concerned, will continue their usefulness indefinitely, furnishing insurance in comparatively small amounts at low rates to those most in need of it and least able to pay for it at high rates.

FRATERNITIES (Lat. *fraternitas*, brotherhood, from *fraternus*, brotherly, from *frater*, brother; connected with Gk. *φράτηρ*, *phratēr*, clansman, OChurch Slav. *bratrŭ*, OPruss. *bratis*, Lith. *brōlis*, Ir., Gael. *brathair*, Corn. *bredar*, Skt. *bhrātar*, Goth. *brōþar*, OHG. *bruodar*, Ger. *Bruder*, AS. *brōþor*, Eng. *brother*), American College. Societies of students found in nearly all the colleges and universities of the United States. In general they are secret in character; but this secrecy is largely nominal, consisting chiefly of extreme care in protecting their constitutions and mottoes from outside knowledge, and in holding secret meetings. Aside from this they do not cultivate mystery in their methods or work. The fraternities are composed of branches called 'chapters,' situated in the various colleges. But no fraternity has more than one chapter in any one college. Usually the students of all collegiate departments are eligible to membership, though the academic department has uniformly furnished the largest part of fraternity membership. Fraternities are variously termed by outsiders, 'Greek-Letter Fraternities,' and 'College Secret Societies,' but among themselves the term 'Fraternities' is universally used.

Nomenclature. The Greek alphabet is generally employed to name both the fraternity and the chapter. Usually a Greek letter is assigned to a chapter according to the order of its establishment; but in some fraternities the name of the State may be added, and infrequently the chapter takes its name from the college or town in which it is placed. An extremely rare instance is known of one chapter, which is named after a prominent individual. When chapters have used all the letters of the alphabet, it is customary to start anew, and add the word 'deuteron' to the letter, thus signifying second. The badges of the fraternities are of three types. One is a plate of gold, which displays the fraternity name and one or more symbols of special significance. A second form is a monogram of the letters of the fraternity, while the third is a symbol, as a key, a skull, or a scroll.

Origin, etc. The first Greek-letter society, Phi Beta Kappa, was organized at the College of William and Mary in 1776. "The promotion of literature and of friendly intercourse among scholars" was its given *raison d'être*. Its origin is legendary. Three stories of its birth have been handed down by tradition. One gives Thomas Jefferson the honor of founder, one asserts that it sprang from a lodge of Free Masons, the third claims that it was brought from Europe. The first meeting was held in the Apollo room of the old Raleigh Tavern at Williamsburg, Va., a spot made famous by the historic speech of Patrick Henry. In December, 1779, branches were authorized at Yale and Harvard, and in 1780 the meetings of the parent chapter ended amid the vicissitudes of the Revolution, then raging in the immediate vicinity of Williamsburg. The Yale chapter was established in 1780, and that at Harvard in 1781. In 1787 these two chapters united to found a chapter at Dartmouth College. In 1831 the Harvard chapter gave up its individual secrets, and in that year its motto, 'Philosophy, the Guide of



KAPPA KAPPA GAMMA

ZETA PSI

SIGMA PHI

ALPHA DELTA PHI

KAPPA ALPHA (SOUTHERN.)

PHI GAMMA DELTA

CHI PSI

DELTA KAPPA EPSILON

PHI DELTA THETA

KAPPA ALPHA THETA

SIGMA CHI

PHI BETA KAPPA

KAPPA SIGMA

BETA THETA PI

SIGMA ALPHA EPSILON

DELTA TAU DELTA

PSI UPSILON

DELTA UPSILON

ALPHA TAU OMEGA

PHI KAPPA PSI

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BADGES OF REPRESENTATIVE AMERICAN COLLEGE FRATERNITIES.

Life,' became public. Since 1831 a purely honorary status has existed, and membership is gained only by high scholarship, and given only to honor men usually of graduating classes. (See PHI BETA KAPPA.) In Yale in 1821 a literary society was founded, called the Chi Delta Theta. Many other literary societies existed at about the same time, in which might be mastered the art of debate, and in which oratory might be indulged in before an audience of college mates. These literary societies served no mean part in college life, and they had faculty approbation and encouragement; but their literary contests and election rivalries destroyed any deep fraternal interest in them. The fraternity system, as it exists to-day, originated at Union College in 1825, when the Kappa Alpha, the first of men's general fraternities, was established. Externally it imitated the Phi Beta Kappa in its secrecy, in its Greek title, and in its limitation of membership to upper-class men. The start of the fraternity system was very simple. But its novelty was so marked that it at once aroused opposition on the part of the faculty. That attitude has now, however, almost entirely changed. Antagonistic legislation has been greatly modified or else abandoned. Faculty and students dwell in amity, and through the medium of the chapter houses entertain and meet socially their instructors. Ex-President White, of Cornell, President Andrews, of Nebraska University, and other leading educators both East and West, have given public expression to their belief in the utility and value of the college fraternity system. In 1827 we find the Sigma Phi and the Delta Phi established at Union. The system was now well launched, but at one institution alone. In 1831 the Sigma Phi placed the first chapter of any fraternity (omitting Φ B K, now become an honor society) at Hamilton College; and this move probably led to the foundation of Alpha Delta Phi at Hamilton as a competitor in 1832. Alpha Delta Phi started a chapter at Miami University in 1835. Prior to this expansion the fraternity system was confined to two States, New York and Massachusetts, and to the three colleges, Union, Hamilton, and Williams. At Miami in 1839 another fraternity, the Beta Theta Pi, was founded. Before 1839 Union College saw one more fraternity established, the Psi Upsilon, in 1833. At Williams was founded the Delta Upsilon in 1834. The year 1840, thirteen years after the foundation of Kappa Alpha, marks the time when the system could be clearly termed national. Since that period the system has spread, the establishment of fraternities and chapters becoming more frequent until, in 1898, the last year in which a statistical canvass was made, there were approximately 800 chapters in existence. One society, the Delta Upsilon, was in its foundation at least entirely anti-secret. The advent of the fraternity system hurt the prestige of the literary societies through competition for membership and in other ways, and on that account four literary societies met in convention in 1847, and formed the 'Anti-Secret Confederation.' In 1858 a fraternity was effected out of this confederation, changing its status and adopting the monogram badge of Delta Upsilon. In time Delta Upsilon became only nominally non-secret, to-day ranking practically with other secret fraternities. It is believed that no other non-secret fraternity could be successfully started.

WOMEN'S FRATERNITIES. The women's fraternities followed naturally upon the general opening of colleges to co-education, and as young women came to participate more and more in college life, to live in dormitories, and take up college residence. The first of these sororities (as these fraternities are called) was the Kappa Alpha Theta, founded at De Pauw University in 1870. The second, Kappa Kappa Gamma, was founded at Monmouth College in the same year. The Delta Gamma started at the University of Mississippi in 1872, and the Alpha Phi was also installed in 1872 at Syracuse University. The Gamma Phi Beta was launched at Syracuse University in 1874. The Delta Delta Delta was organized at Boston University in 1888, and the Pi Beta Phi (originally I C Sorosis) was founded at Monmouth College in 1867. These societies are practically identical in aims and purposes with the men's fraternities, and in colleges where houses are owned by sororities their general similarity as part of the college organization is marked. It is but thirty-two years since the first sorority was founded. To-day the alumni interest is very strong, and has taken material expression in homes for the sororities at various colleges and universities.

LOCAL FRATERNITIES. Local fraternities are many and important. Those at Yale University have become the most widely known. They are senior societies, and are three in number: Skull and Bones (1832), Scroll and Key (1841), Wolf's Head (1884). They always elect fifteen men in each year, have no electioneering or pledging, but offer their elections on the campus on a certain date of each year in an impressive manner in the presence of the student body. The system is peculiar, and exists at no other college.

ORGANIZATION, ETC. Prior to 1861, the government of a fraternity was usually retained as a heritage by one chapter, but was modified at times by the several chapters assembled in convention. The year 1870 is generally accepted as the date of a solidified system. After the Civil War the fraternities which had suffered through the enlistment of their members—and in some cases a whole chapter would be enlisted—recovered activity, and widened their organizations. Then a better government was effected, the governing powers becoming well centralized and stable. In general, the legislative power of fraternities has been vested in an annual convention of delegates, while the administration has been placed upon a few officers there elected.

Social life forms the basic *raison d'être* of all fraternities. They seek as members those who promise to contribute most to a fellowship where social equality, good scholarship, athletic abilites, and mutual helpfulness are sure to be maintained.

Naturally the contest for members is intense. In general this campaign is the great student feature of the beginning of each college year. Entrance to the fraternity is gained by an initiation, which is widely announced among the members, and usually attracts a large alumni attendance. The chapter house is the most notable part of fraternity life. Statistics show that there were in 1883 but 33 houses owned and occupied by the general fraternities. In 1890 there were 70 such houses. But in 1898 425 houses were owned or occupied by the national, local, and women's fraternities of the United

States. Of these 134 were owned by the men's fraternities, and 3 owned by the sororities. This great increase is instructive, illustrating the growth of fraternities in a single decade.

The control of the chapter house is vested in a corporation of alumni, but generally subject to the immediate management of the students.

Fraternity members are styled 'active' when in actual college attendance; 'alumni' afterwards. Should they be elected while not undergraduates, they are termed honorary members. To bestow honorary membership is, however, at the present time generally discountenanced. For a member to belong to two fraternities at any one college, or to two at different times in different colleges, is reprehensible and forbidden. Most fraternities publish catalogues, song-books, and magazines. Each fraternity deems a catalogue a necessity. In early days these were mere lists of membership, but now they generally contain addresses of members, the rolls of chapters, and tables of varied statistics, including an important table showing the geographical distribution of chapters and members. Histories have been issued by a few of the fraternities. The song-books have special music in addition to usual college songs, with words written by members. The periodicals are an important factor in the fraternity life. Periodicals are now published by Alpha Tau Omega, Alpha Chi Rho, Beta Theta Pi, Chi, Psi, Delta Kappa Epsilon, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Phi Delta Theta, Phi Gamma Delta, Phi Kappa Psi, Phi Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Theta Delta Chi. The following women's fraternities publish periodicals: Alpha Chi Omega, Alpha Phi, Chi Omega, Delta Delta Delta, Delta Gamma, Kappa Alpha Theta, Kappa Kappa Gamma, Pi Beta Phi.

The legal status of fraternities has in several cases been in litigation. In one case, hinging upon the right of a college faculty to debar a student because of his fraternity membership, the Supreme Court of Indiana (1881) decided: "There is no doubt whatever that if an applicant for admission into a public college is otherwise qualified, and there is room to receive him, he cannot be denied admission by reason of membership in a college fraternity." And the Court held further that the requiring by the faculty of a written pledge from the student that he would not join a fraternity, as a condition precedent to his matriculation, implied discrimination against a class of inhabitants of the State. On the other hand, it appears to be established that a privately endowed and managed college may exact and enforce such a pledge. In May, 1901, the Arkansas Legislature enacted a law "to prohibit the organization of (and membership in) secret societies in the University of Arkansas, and for other purposes." The legality of this law is to be tested in the courts. One of the most important cases that has been recently decided, at least from a theoretical point of view, and involving the internal organization and powers of a fraternity, was that of the Kappa Kappa Gamma Society versus certain members of its Grand Council. The Grand Council had endeavored to withdraw, without its consent, its Beta Beta chapter, and suits to restrain the Council, through the individual members thereof, were instituted in New York and Massachusetts. The Massachusetts court dismissed the suit on the ground that no property right was involved; but the New York courts held, on appeal, among other things, that the *publication of fraternity suits* by the Beta Beta chapter had been proper, inasmuch as the fraternity had virtually compelled it; that rights were affected for which a court of equity could give remedy, and that the fraternity should, on the facts presented, be restrained from withdrawing its chapter. Consult: Baird, *American College Fraternities* (New York, 1898); Kellogg, *College Secret Societies* (Chicago, 1874); Aiken, *The Secret Society System* (New Haven, 1882); Emerson, *The College Year-Book and Athletic Record* (New York, 1897); Maxwell, *Greek Letter Men of New York* (New York, 1899); Randolph, "Greek Letter Societies in American Colleges," in *New England Magazine*, vol. xvii.; "White Fraternities," in *Forum*, vol. iii. For information concerning college societies which are not, strictly speaking, fraternities, see SOCIETIES; COLLEGE.

FRA'TICEL'LIANS, or **FRATICELLI**, frä-ti-chĕl'lĕ (It., ML. *fraticelli*, little brethren, diminutive of Lat. *frater*, brother). A name applied to various more or less strictly defined heretical sects of the Middle Ages, not closely connected either by their beliefs and tendencies or by their time. Their general tendency was one of protest against the existing ecclesiastical and social order, and there is little to distinguish them, to the modern mind, from the Albigenses, Waldenses, Catharini, Beghards, and Brethren of the Free Spirit. The name is found as early as the beginning of the fourteenth century, for example in the chronicle of Giovanni Villani. The origin of the Fraticelli proper has often been connected with the Franciscan Order, or with a particularly strict and rigorist party within it. This theory is supported by the fact that this name was common in Italy to designate the Friars Minor; but it seems much more likely that, as the immense popularity of the Franciscan Order produced a multitude of unauthorized imitations of it, these innovations in doctrine found ready acceptance in such groups, unrestrained as they were by any close oversight of ecclesiastical authority. As a sect, their origin may, with the greatest probability, be traced to Gherardo Segarelli, a laboring man of Parma, and his disciple, Dolcino of Novara, who organized their followers as an 'apostolic Order,' and made considerable noise in Upper Italy from 1260 to 1307. They declared poverty an absolutely essential condition of belonging to the true Church, and regarded the existing Church as in a state of apostasy. They had no fixed domiciles, but wandered from place to place. They were not bound by any definite rule, and under Dolcino at least, their career was marked by the 'free-love' excesses which have formed part of the history of later Anabaptist and communistic associations. The adherents of Segarelli and Dolcino held that all authority was forfeited by sin, and proceeded to fill all the offices which, on their hypothesis, were vacant, electing a certain Majoretti Emperor, a secular priest named Rainaldo Pope, and choosing archbishops of Florence and Venice and a general of the Franciscans who did not even belong to the Order. They were gradually suppressed in the course of the first half of the fifteenth century; John Capistrano was commissioned as inquisitor-general in their regard by Martin V., Eugenius

IV., and Nicholas V., and succeeded in completing their eradication. Their last pseudo-pope was burned at Fabriano in 1449, and the sect disappears from history with him. For the sake of clearness, it would be well to restrict the name Fraticelli to the sect above described; but it is sometimes given to the rigorist Franciscans, and to the followers of Michael of Cesena. Consult: Döllinger, *Beiträge zur Sektengeschichte des Mittelalters* (Munich, 1890); Lea, *History of the Inquisition* (London, 1894); and see FRANCISCANS.

FRATTAMAGGIORE, frät′tȧ-mȧ-jō′rȧ. A city in South Italy, 8 miles north of Naples, with silk and rope factories and numerous country houses of rich Neapolitans (Map: Italy, D 10). Population, commune, in 1881, 11,000; in 1901, 13,170.

FRAUD. In its broadest sense, any variety of falsehood and artifice by which one deceives another to his legal injury. Courts have been cautious about defining this term, fearing that any precise and complete definition would tend to help crafty and dishonest persons in their attempts to evade the law, and would embarrass the courts themselves, when called upon to deal with new forms of fraud. In the courts of common law the term has borne a narrower and more exact signification than in courts of equity. We will deal with these significations separately.

At law, fraud is a false representation of some matter of fact, intended to deceive another and actually deceiving him to his legal injury. All of these elements must concur. There must be a false representation of fact as distinguished from an expression of opinion. A person who induces another to buy a horse for three hundred dollars, by falsely asserting that it is worth that sum when he knows it is worth but a hundred dollars, acts dishonorably, but does not render himself liable to an action for fraud. He has expressed an opinion, not asserted a matter of fact. Had he declared that the horse could trot a mile in three minutes, or was of a certain strain of blood, or was sound, he would have asserted a fact, which the other party would have had a legal right to rely on. It is to be borne in mind that a false representation may be made by conduct as well as by words; as when a manufacturer skillfully conceals a defect in an article. Simple non-disclosure of the truth, however, does not amount to fraud, for fraud involves the idea of active misconduct. If, however, a party makes a statement which is true as far as it goes, but because of his non-disclosure of other facts the statement conveys a misleading impression and deceives the other party, we have a case of fraudulent concealment.

Not only must the representation be one of fact, but the one making it must know it to be false; or he must make it in reckless disregard of its truth. In other words, there must be a dishonest intention to deceive. Mere negligence in asserting as a fact that which turns out to be false is not fraud, although it may subject the negligent actor to some other liability. Such, at least, is the doctrine which now prevails in England and in most of our States. The third element in an actionable fraud is the deception of the injured party. A manufacturer may patch up a defective article, intending to deceive a purchaser by such concealment of the defect. Still if a person buys the article without question or examination, his purchase cannot be said to have been induced by the fraudulent conduct of the manufacturer. He was not deceived. He was simply careless.

While the one who complains of a false representation must show that he was actually deceived by it, he need not show that it was the sole or predominant motive to action. It is enough that it materially affected his decision; that it induced him to act as he would not have acted had it not been made. Finally, the deception must result in legal injury to a person, or he cannot insist that he has been defrauded. The law does not give redress for a naked lie. It leaves the punishment of that to another forum.

The legal effect of a fraud is to render every contract or transaction in which it is a material element voidable at the option of the defrauded party. One who has been defrauded into buying and paying for property has the right to rescind the contract, tender back the property, and recover the price. If one has been induced by fraud to sell property on credit, he may retake the property. Rescission is not the only right of the defrauded party, however. He may maintain an action for damages against the wrongdoer.

IN EQUITY. Courts of equity have been accustomed to characterize such fraud as we have been considering as actual fraud, while they designate active misconduct as 'constructive fraud,' or 'conduct amounting to fraud in the contemplation of a court of equity,' or 'fraudulent in the eyes of this court.' Most of the acts falling within these categories, however, are distinguishable from fraud, in its proper sense; and courts of equity relieve against them, not because they have actually deceived their victim, but because they are repugnant to sound public policy, or because they fall under the head of *undue influence* (q.v.). In the language of Hardwicke, "Fraud does not here mean deceit or circumvention; it means an unconscientious use of the power arising out of certain circumstances and conditions; and when the relative position of the parties is such as *prima facie* to raise the presumption 'of undue influence by one over the other,' the transaction cannot stand, unless the person claiming the benefit of it is able to repel the presumption by contrary evidence, proving it to have been, in point of fact, fair, just, and reasonable." Consult the authorities referred to under CONTRACT; TORT; and also Bigelow, *The Law of Fraud on its Evil Side* (Boston, 1888); Kerr, *Treatise on the Law of Fraud and Mistake* (4th ed., London, 1902).

FRAUDS, STATUTE OF. A statute originally passed in the year 1676 (ch. 3 of 29 Charles II.), and taking its name from its purpose, as expressed in the preamble—"the prevention of many fraudulent practices which are commonly endeavored to be upheld by perjury and subornation of perjury." This purpose the framers of the law thought could be accomplished by requiring written evidence, or certain formal acts of the parties, as proof of the more important business transactions. The statutes contain twenty-five sections, the most important of which may be classified as follows: The first three specify the manner in which interests in land may be created or assigned. The fourth describes the evidence requisite to establish certain agreements. The fifth and sixth, as well as sections nineteen to twenty-two inclusive, regulate the execution and proof of wills. Sections seven to ten inclusive relate to trusts in lands. The seventeenth section applies to sales of personal property.

Opinions concerning the policy and the consequences of this statute have differed widely. It has received unstinted praise from judges and writers of great reputation, while it has been unmercifully criticised by others equally eminent. Chancellor Kent approved the view that every line of it was worth a subsidy, and declared that it would be hazardous to attempt to recast the statute in new language, or to disturb the order and style of its composition. On the other hand, Chief Justice Erle of England asserted that although the statute had been very much praised, he believed "that the party who inserted the words had no idea what he meant by 'acceptance'"; "that opinion," he added, "I found on the everlasting discussion which has gone on." Mr. Justice Stephen repeatedly characterized the seventeenth section as a nuisance, declaring that it "sins against several of what ought to be the well-recognized rules of national legislation." Notwithstanding the severe criticisms to which the statute has been subjected, most of its provisions have been reënacted by our State legislatures. Some of these have undoubtedly proved very beneficial, especially those relating to wills and to conveyances of interests in land. This is admitted even by Mr. Justice Stephen. The sections which have proved must fruitful of expensive and dishonorable litigation are the fourth and seventeenth, which are as follows: "That no action shall be brought (1) whereby to charge any executor or administrator upon any special promise to answer damages out of his own estate; (2) or whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another person; (3) or to charge any person upon any agreement made upon consideration of marriage; (4) or upon any contract or sale of lands, tenements, or hereditaments or any interest in or concerning them; (5) or upon any agreement that is not to be performed within the space of one year from the making thereof, unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing and signed by the party to be charged therewith, or some other person thereunto by him lawfully authorized." "That no contract for the sale of any goods, wares, and merchandises, for the price of ten pounds sterling or upward, shall be allowed to be good, except the buyer shall accept part of the goods so sold, and actually receive the same, or give something in earnest to bind the bargain, or in part payment, or that some note or memorandum in writing of the said bargain be made and signed by the parties to be charged by such contract, or their agents thereunto lawfully authorized." The latter of these sections has been discarded in sixteen of our States, viz. Alabama, Arizona, Delaware, Illinois, Kansas, Kentucky, Louisiana, New Mexico, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, and West Virginia. In the others it has been reënacted, although with various modifications of language.

It is to be noted that the English statute does not declare contracts void which are not entered into, or evidenced, as required by its provisions. "No action shall be brought," or "No contract shall be allowed to be good," is the language of the act. In some of them has been substituted for these expressions such language as this: "Every contract . . . shall be void," or "the agreement is invalid," unless the statutory requirements are complied with. Even in such States, however, the courts have generally construed the statute as it has been construed in England, not to render compliance with its provisions essential to the validity of the enumerated contracts, but only necessary to the proof of such contracts against the party who sets up the statute as a defense. For the application of this statute to particular topics, see the articles CONTRACT; EXECUTION; GUARANTY; INDEMNITY; LEASE; MARRIAGE; PRINCIPAL AND SURETY; SALE OF GOODS; SPECIFIC PERFORMANCE; TRUSTS; WILLS. Consult: 1 *Law Quarterly Review*, p. 1; 5 *Encyclopædia of the Laws of England;* Browne, *Treatise on the Construction of the Statute of Frauds* (5th ed., Boston, 1895).

FRAUDULENT CONVEYANCE. A transfer of property in fraud of creditors or purchasers. It is undoubtedly voidable at common law by the party defrauded, but for more than three centuries it has also been under the ban of statutes known as 13 Eliz., c. 5 (1571), and 27 Eliz., c. 4 (1585). Although these enactments are generally accounted a part of 'the common law which accompanied the emigration of our ancestors' to this country, their provisions have been reënacted in most of our States. The first of these English statutes, after reciting "that feoffments, gifts, grants, alienations, conveyances, bonds, suits, judgments, and executions have been contrived of malice, fraud, covin, collusion, or guile, to delay, hinder or defraud creditors or others of their just and lawful actions, suits, debts, accounts, damages, forfeitures, etc.," proceeds to declare that every such transfer or incumbrance of real or personal property shall be utterly void "as against that person, his heirs, successors, executors, administrators, or assignees, whose actions, etc., are or might be in any wise disturbed, delayed, hindered or defrauded by such practices"; unless such transfer or incumbrance was made upon a good consideration and *bona fide* to one not having notice of the fraud.

This statute includes every kind of property which creditors of a transferror have a legal right to seize and sell in satisfaction of their claims. It is not necessary that the transferror be guilty of actual fraud. He may believe that it is his moral duty to give the property in question to the transferree, but if such gift leaves him insolvent—unable to pay his lawful debts—its necessary consequence is to hinder and delay his creditors; to take from them property which the law permits them to claim, and divert it to the use of others who have no such right. Such conduct is properly characterized as fraudulent, for it is a breach of the legal duty 'to be just before one is generous.' The statute does not apply to property which is exempt from creditors' claims; nor does it confer any benefit upon creditors who become such after the conveyance is made. A transfer of property may be set aside, however, by subsequent creditors if it was made with actual attempt to defraud them.

The second statute above named to refers only to purchasers of lands—avoiding all conveyances of real estate interests "made for the intent to defraud and deceive such persons as shall purchase the same lands." In England it is held that a voluntary conveyance of real estate, even for a meritorious purpose, such as providing for wife and children, is within the policy of the statute, and may be set aside by any subsequent purchaser for value, although he buys with notice of such conveyance. In this country, however, the doctrine is limited to purchasers for value and without notice.

Conveyances of the character under consideration are not absolutely void; they are only voidable. As between the parties to the transaction they are binding. Even when impeached by creditors and purchasers, they are set aside only to the extent necessary to give effect to the rights of complainants.

Consult: May, *Treatise on the Statutes of Elizabeth Against Fraudulent Conveyances* (2d ed., London and Philadelphia, 1887); Bump, *Treatise Upon Conveyances Made by Debtors to Defraud Creditors* (4th ed., Washington, 1896); Wait, *Treatise on Fraudulent Conveyances* (3d ed., New York, 1897); Hunt, *The Law Relating to Fraudulent Conveyances* (London, 1897).

FRAUENBURG, frou′en-bo͞ork. A town in the Government-District of Königsberg, Prussia, 41 miles southwest of Königsberg (Map: Germany, H 1). Copernicus was once Canon of Frauenburg, and died there. The fine Gothic cathedral contains his tomb. Population, in 1900, 2492.

FRAUENFELD, frou′en-fĕlt. The capital of the Canton of Thurgau, Switzerland, situated in a beautiful and fertile district on the Murg, 23 miles northeast of Zurich (Map: Switzerland, C 1). It is regularly built, and has among its buildings a Catholic church dating from 1286, and an old castle, the Government building, containing the cantonal archives and library, the town hall, and the military barracks. There is a technical school with scientific and historical collections. The town manufactures gloves, cotton and iron goods, guns, machinery and leather, and is also a centre of trade for wine, fruit, and agricultural products. Population (commune), in 1900, 7861.

FRAUENLOB, frou′en-lōb (Ger., ladies' praise) (c.1250-1318). The assumed name of Heinrich von Meissen, one of the German minnesingers (q.v.). He is said to have established the first school of minstrelsy in Mainz, and so to have made himself a 'mastersinger' (q.v.) also. In token of appreciation for his chivalrous devotion to 'ladyhood,' ladies of Mainz are said to have borne his body to the grave in the cathedral. During the Werther period of German literature ladies restored his tombstone in 1783, and near it other ladies, in 1842, erected a beautiful monument. Frauenlob's erudite and artificial poems have been edited by E. H. Müller (1843), and his *Cantica Canticorum* has been translated into English.

FRAUENSTÄDT, frou′en-stĕt, Julius (1813-79). A German philosopher, born at Bojanowo, Province of Posen, Prussia. He studied theology and philosophy at Berlin, and subsequently became one of the most ardent disciples of Arthur Schopenhauer. Many of his works reflect the influence of that profound thinker, whose ideas Frauenstädt extends, but frequently also subjects to some modification. Some of his more important works are: *Die Naturwissenschaft in ihrem Einfluss auf Poesie, Religion, Moral und Philosophie* (1855); and *Neue Briefe über die Schopenhauersche Philosophie* (1876); *A. Schopenhauer: Lichtstrahlen aus seinen Werken* (7th ed. 1891). He also edited the first complete edition of Schopenhauer's collected works (1873-74).

FRAUNCES'S TAVERN. One of the oldest buildings of New York City, at the southeast corner of Broad and Pearl Streets; originally a mansion of the Delanceys, and subsequently transformed into a tavern. Washington made it his headquarters after the British evacuation of New York, and in it took farewell of his officers on December 4, 1783. The New York Chamber of Commerce was organized in it in 1768. In 1902 it was purchased by the city to be preserved as an historic memorial.

FRAUNHOFER, froun′hō-fẽr, Joseph von (1787-1826). A distinguished Bavarian optician and physicist, born at Straubing. In 1799 he was apprenticed to a glass-cutter in Munich, and in 1806 was received, as a working optician, into the establishment of Reichenbach & Utzschneider at Benedictbeuern, of which he later became the head, and which afterwards, in 1819, was removed to Munich. While there, he acquired considerable wealth and reputation through his inventions, and soon afterwards became proprietor of the establishment. He was especially successful in producing large pieces of optical glass free from imperfections, which could be used for prisms and lenses, and as he combined the mechanical skill and technique of the optician with the theoretical knowledge and mathematical training of the physicist, his instruments were always in demand. He invented a machine for polishing parabolic surfaces, and was the first one who succeeded in polishing lenses and mirrors without altering their curvature. Prisms made under his direction were celebrated for being free from inequalities and striæ. His inventions are numerous, and include a heliometer, a micrometer, an achromatic microscope, besides the great refracting telescope at Dorpat. But that which has rendered Fraunhofer's name celebrated throughout the scientific world is his discovery of the dark lines in the spectrum, which are now known by his name. (See Spectrum.) He was the first to obtain a spectrum from a grating (see Diffraction Grating), and with this apparatus was able to measure the wave-length of sodium light. Fraunhofer was a diligent student and investigator as well as a successful instrument-maker, and was elected a member of the Munich Academy of Sciences (1817), and five years later became conservator of its physical cabinet.

FRAUNHOFER LINES. See Spectroscopy.

FRAX′INEL′LA. See Dittany.

FRAX′INUS. See Ash.

FRAY GERUNDIO, frä′ê hȧ-ro͞on′dê-ô. See Lafuente, Modesta.

FRAY GERUNDIO DE CAMPAZAS, dȧ kȧm-pä′thȧs. A romance by Isla (1758), satirizing the degraded type of pulpit oratory of the period in Spain.

FRAYSSINOUS, frȧ′sē̇′nōō′, Denis, Count de (1765-1841). A French prelate, born at Curières. He became known at Paris for his pulpit oratory, and in 1816 was appointed Court preacher and first almoner to Louis XVIII. In 1824 he became Minister of Public Worship, but in 1828 resigned the post. He was compelled to leave France at the time of the July Revolution. In his own day his *Défense du christianisme* (3 vols. 1825) attracted great attention. The work was republished at Paris in 1889 (2 vols.). Consult the biography by Henrion (Paris, 2 vols. 1844).

FRA′ZER, John Fries (1812-72). An American scientist, born in Philadelphia, Pa. He graduated in 1830 at the University of Pennsylvania, in 1836 was appointed first assistant geologist in the first geological survey of Pennsylvania, and from 1836 to 1844 was instructor in chemistry and natural philosophy at the Philadelphia High School. From 1844 until his death he was professor of natural history and philosophy in the University of Pennsylvania. He was also vice-provost of the university in 1855-68. For some time he was connected with the Franklin Institute as a lecturer, and edited the *Journal* of the Institute, to which he contributed several papers, which constitute the most important part of his published writings. He was elected to the American Philosophical Society in 1842, and in 1863 became a charter member of the National Academy of Sciences.

FRAZER, Persifor (1844—). An American geologist, born in Philadelphia, Pa. He graduated at the University of Pennsylvania in 1862, was an aide on the United States Coast Survey in 1862-63, served as acting ensign in the Mississippi Squadron in 1863-65, and from 1866 to 1869 studied in the School of Mines at Freiberg, Saxony. In 1869-70 he was mineralogist and metallurgist on the United States Geological Survey, in 1870-74 was professor of chemistry in the University of Pennsylvania, and from 1874 to 1882 was assistant in connection with the second geological survey of Pennsylvania. Among his contributions to science may be cited his explanation of the cause of the white color of the moon as observed by day. He was elected to the American Philosophical Society in 1871. His publications include, in addition to four volumes of reports of the second geological survey of Pennsylvania: *Tables for the Determination of Minerals* (1874; 4th ed. 1896); *Bibliotics, or the Study of Documents* (1894; 3d ed. 1901), on which subject he is an authority, and upward of three hundred contributions to scientific periodicals.

FRAZIER'S or **FRAYSER'S FARM,** Battle of; also called the Battle of Glendale, the Battle of Charles City Cross Roads, and the Battle of Nelson's Farm. A battle fought at Glendale, Va., about twelve miles southeast of Richmond, on June 30, 1862, during the Civil War, between a Federal force under General McClellan and a Confederate force under Generals Longstreet and Hill. The losses were about 1800 on the Federal and about 2000 on the Confederate side.

FRÉCHETTE, frȧ′shĕt′, Louis Honoré (1839—). A French-Canadian poet. He was born at Point Levi, P. Q., and was educated at the Quebec Seminary and Laval University. He was called to the bar in 1864, but was in newspaper work in Chicago for the following six or seven years. In 1874 he represented his native town in the Dominion Parliament, and practiced his profession in Quebec until 1879, when he went again into journalism, and successively edited three French papers, respectively in Quebec, Montreal, and Chicago. He is the representative poet of French Canada, and his productions have brought him honor from many societies, including the French Academy and the Imperial Institute, London. He was also made a knight of the Legion of Honor, and served as president of the Royal Society of Canada. His literary work includes a five-act play, entitled *Veronica*, and other dramas, one sketch in English called *Christmas in French Canada* (1899), and a few prose essays in French, and translations of Howells's *Chance Acquaintance*, and Cable's *Creole Days* into his native tongue; but he will be best remembered by his poems: *Mes loisirs* (1863); *La voix d'un exilé* (1869); *Pêle-mêle* (1877); *Les fleurs boréales* (1880); *Les oiseaux de neige* (1880); *La légende d'un peuple* (1887); and *Les feuilles volantes* (1891).

FRECKLES, frĕk′k'lz (older form *frecken*, from Icel. *freknur*, freckles; ultimately connected with Gk. *περκνός*, *perknos*, spotted), sometimes called *lentigo*. Small yellowish or brownish-yellow irregularly rounded spots, from the size of a pin's head to that of a split pea, frequently seen on the skin, especially of fair or reddish-haired persons, though they are seen even in mulattoes. They are not often met with under the age of six or eight. They are most common on the face, but often occur on the hands, and sometimes elsewhere. They are always most distinct in summer; but though the influence of the sun's rays undoubtedly increases their distinctness, it is doubtful whether it can cause them. They are due to increased local deposit of pigment-granules in the epidermis; and it may be noticed that persons subject to them do not bronze uniformly under the influence of exposure nearly so deeply as others. Many methods of treatment have been advocated for their removal; but in most cases they return upon exposure to the sun. Among the milder measures which sometimes succeed in improving the condition is a solution of hyposulphite of soda, 15 to 30 grains, or of chloride of ammonium, 15 grains to the ounce of water.

FRED′EGAR, or **FRED′EGA′RIUS SCHOLAS′TICUS.** A chronicler of the Franks, who lived in the seventh century. He was one of the three compilers of the *Historia Francorum*, or a history of the Franks down to the year A.D. 642. The work is written in corrupt Latin, but is of great value as a source for the history of France during the first half of the seventh century. During the eighth century it was continued in the so-called *Gesta Francorum*. Consult Kruselis, *Fredegarii et Aliorum Chronica* (Hanover, 1888).

FRED′EGUN′DA (c.545-597). A Frankish queen. Originally a servant of Audovere, wife of Chilperic of Neustria, she soon won the King's heart, and got him to put his wife in a convent and to divorce her. But Chilperic married Galsvintha, and put away Fredegunda. Galsvintha died in the same year (567), probably strangled by Fredegunda, who succeeded her as Queen. This brought on war between Chilperic and his brother Sigibert, King of Austrasia, and a bitter rivalry between Fredegunda and Brunhilda, sister of the murdered Queen and wife to Sigibert, who was soon assassinated by Fredegunda's agents at Vitry (575). Chilperic's sons by Audovere also died suddenly, and in 584 Chilperic was murdered, and by contemporary historians the Queen was accused of instigating all three murders. Now, with her son Clotaire upon the throne, she put forth all her efforts to kill Brunhilda and her son Childebert, and, unsuccessful in this, made war on Austrasia after Childebert's death, obtained possession of Paris and other cities, but died in the following year. See BRUNHILDA.

FRED′ERIC, HAROLD (1856-98). An American novelist and journalist. He was born in Utica, N. Y., August 19, 1856, and was London correspondent of the New York *Times* from 1884 till his premature death in Hornby, England, October 19, 1898. He was educated in Utica, worked at journalism there, in Albany, and in New York; but won distinction for novels, chiefly of rural life in central New York, written after his going to England. His first important story, *Seth's Brother's Wife* (1887), was followed by *The Lawton Girl* (1890); *In the Valley* (1890), a story of 1777; *The Return of the O'Mahoney* (1892); *The Copperhead* (1894), a story of the Civil War; and *Marsena* (1895), a collection of keenly humorous character stories. All these, however, were surpassed by *The Damnation of Theron Ware* (1896), a brilliant analysis of religious life in the American middle class, minutely realistic in detail, clever in conversation, and unfailing in psychic insight, immediately recognized by the public as a human document. His last works, *March Hares* (1896), *Gloria Mundi* (1898), and *In the Marketplace* (1899), were less significant. *The New Exodus* (1892) was a study of Anti-Semitism, the result of a visit to Russia, undertaken in 1891.

FREDERICH, frā′de-rĭk, BERTHA (pseudonym, GOLO RAIMUND) (1825-82). A German novelist, born at Hanover. She was the wife of Eduard Frederich, editor of the *Hannöverscher Courier*, in which paper her first efforts appeared. In order to conceal her identity more effectually, she not only chose the above pseudonym, but managed to have the true authorship of her novels ascribed to a fictitious personage, "Georg Dannenberg." She wrote, in all, about twenty-two novels, nearly all of which have been republished. Among them are: *Bauernlehen* (3d ed. 1888); *Zwei Bräute* (4th ed. 1888); *Schloss Elkrath* (3d ed. 1885); *Von Hand zu Hand* (2d ed. 1885); *Mein ist die Rache* (3d ed. 1885); *Zwei Menschenalter* (3d ed. 1886); *Ein deutsches Weib* (5th ed. 1886).

FREDERICIA, frĕd′ẽr-ĭs′ĭ-ȧ. A seaport of Denmark, situated on the east coast of Jutland, on a projecting tongue of land; at the northern entrance to the Little Belt (Map: Denmark, C 3). The town is surrounded by fortifications, now falling into ruins, and has a famous bronze statue, "The Danish Soldier," erected in commemoration of the victory of the Danes over the Schleswig-Holstein forces in 1849. Fredericia is connected with Strib, on the island of Fünen, by steamer, and carries on a considerable trade in exports of meat, fish, eggs, and imports of salt and petroleum. Population, in 1890, 10,000; in 1900, 12,700.

FRED′ERICK. A city and the county-seat of Frederick County, Md., 60 miles west-northwest of Baltimore; on the Baltimore and Ohio and the Pennsylvania railroads (Map: Maryland, H 3). It is situated in a beautiful and fertile valley near the famous battlefields of Monocacy and South Mountain. It is the seat of a State institution for the deaf and dumb, and Women's College (Reformed Church), organized in 1893, and has Boyd Academy and other educational institutions, and Emergency Hospital. There are large canning establishments, brick-works, planing-mills, and manufactures of flour, tobacco, fibre brushes, hosiery, leather, shutter-fasteners, and coaches. The government is administered under a charter of 1898 by a mayor, elected every three years, who controls the appointments to all municipal offices except that of city register, and a council elected at large. The city owns and operates its water-works and electric-light plant. Population, in 1890, 8193; in 1900, 9296. Frederick has been made famous by Whittier as the scene of Barbara Frietchie's exploit. Francis Scott Key, the author of the "Star-Spangled Banner," is buried in Mount Olivet Cemetery, and a splendid monument to him marks its entrance; and the remains of Roger B. Taney (q.v.) lie in the burial-grounds of the Roman Catholic Church. Frederick was first settled in 1745, and was incorporated in 1817. In 1755 Washington met Braddock here to prepare for the expedition against the French. Near by Robert Strawbridge, in 1764, organized a Methodist church, 'the first in Maryland and America.' Consult a sketch in Powell's *Historic Towns of the Southern States* (New York, 1900).

FREDERICK I. (1121-90). Holy Roman Emperor from 1152 to 1190, surnamed Barbarossa or Redbeard. He was born in 1121, succeeded his father, Frederick, as Duke of Swabia, in 1147, and his uncle, Conrad III., as King of Germany, in 1152. On his father's side he belonged to the Hohenstaufen family; on his mother's side to the Guelphs. In the early years of his reign Frederick reduced Germany to order, and then proceeded to reëstablish the Imperial authority in Italy. The Lombard cities, with Milan at their head, flourishing and powerful, and strengthened by the Papal power in their opposition to the Imperial pretensions, were prepared to resist Frederick's attempt to subjugate them. After receiving the Lombard crown at Pavia, Frederick marched in 1155 to Rome, reinstated the authority of Pope Adrian IV., to whom he delivered up Arnold of Brescia, and was crowned Holy Roman Emperor. In 1158 he besieged and took Milan. In the same year, at a Diet held at Roncaglia, Frederick imposed upon the Lombard cities a full feudal régime. Although the cities submitted for the moment, they soon rebelled. In 1159 began the long contest between Frederick Barbarossa and Pope Alexander III., the successor to Adrian IV. The Emperor created an antipope in the person of Victor IV., the first of several antipopes set up by him. The city of Crema was reduced by Frederick after a long siege in 1160, and in 1161-62 he besieged and took Milan, and razed it to the ground. Frederick was triumphant everywhere; but in 1167 the Lombard cities formed a league against him and renewed the struggle. Frederick was completely defeated at Legnano in 1176; and in 1183, in a peace concluded at Constance, he finally agreed to leave the Lombard cities the right to choose their own municipal rulers, and to conclude treaties and leagues among themselves, although he retained his suzerainty over them, together with the power of imposing certain fixed taxes. The difficulty of settling the Italian differences had been aggravated by the attitude of Pope Alexander III. At last, in 1177, Frederick made his peace with the Pope, and was enabled to turn his attention to Germany, where he had to contend with Henry the Lion (q.v.), Duke of Bavaria and Saxony, the powerful head of the House of Guelph. By his energetic measures Frederick succeeded in thoroughly humbling his troublesome vassal, and crushing the Guelph power in Germany. In 1189, having settled the affairs of the Empire and proclaimed universal peace in his dominions, he resigned the government to his eldest son, Henry, and at the head of about 100,000 men set forth for the Holy Land. After gaining two great victories over the Moslems at Philomelium and Iconium, he was drowned in the Calycadnus, a small stream in Cilicia (1190). His remains were rescued by his son, and buried at Tyre. The death of Frederick, which led to the dispersion of the Crusaders before any material advantage had been obtained over the infidels, excited the deepest grief in Germany, where his memory has always been cherished as that of the best and greatest of his race. Frederick made Poland tributary to the Empire, raised Bohemia to the rank of a kingdom, and erected the Margraviate of Austria into an independent hereditary duchy. He was a patron of learning, and enacted many admirable laws, some of which were based upon the Roman law. Consult: Prutz, *Kaiser Friedrich I.* (3 vols., Danzig, 1871-73); Fischer, *Kreuzzug Friedrichs I.* (Leipzig, 1870); Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. v. (Leipzig, 1880-95).

FREDERICK II. (1194-1250). King of Sicily from 1197, and Holy Roman Emperor from 1215 to 1250. He was a grandson of Frederick I., and the son of the Emperor Henry VI. and of Constance, heiress of Sicily. He was born at Jesi, near Ancona, in Italy, December 26, 1194. His mother secured the favor of Pope Innocent III. for her infant son by conceding many important privileges to the Papal chair; and on the death of Constance, in 1198, the Pope became the guardian of the young Prince. As early as 1208 Frederick assumed the reins of government in his realm, which included South Italy in addition to Sicily. Supported by the Pope, Frederick, in 1212, engaged in a contest for the Imperial throne of Germany, with Otho IV., who had as yet not succeeded in securing himself in its possession after his long struggle with the rival claimant, Philip of Swabia, assassinated by Otho of Wittelsbach, in 1208. The blow dealt to Otho IV. by Philip Augustus of France in 1214, in the battle of Bouvines, secured the triumph of Frederick, who was crowned at Aix-la-Chapelle in 1215. On his coronation Frederick took a vow to go on a crusade. Having secured the election of his son Henry as King of the Romans, and leaving Archbishop Engelbert of Cologne as his vicegerent, he went to Italy, and was crowned Emperor at Rome, by Pope Honorius, in 1220. Frederick now devoted himself to the task of organizing his Italian territories. He founded the University of Naples, gave encouragement to the medical school of Salerno, invited to his Court men of learning, poets, and artists, and commissioned his Chancellor, Petrus de Vineis, to draw up a code of laws. Frederick, however, was hampered in his projects by the refractory conduct of the Lombard cities, which in 1226 renewed the league formed against Frederick Barbarossa, and still more by the opposition of the popes. As he delayed going on a crusade, he was threatened with excommunication unless he fulfilled his pledge. Being compelled to depart on this expedition, he made the necessary preparations for its prosecution, and actually started in 1227. He returned in three days, saying that he was ill, whereupon Gregory IX., the successor to Honorius III., excommunicated him. In 1228 Frederick again set out for the Holy Land. This second expedition proved successful, and in 1229 Frederick made a ten years' truce with the Sultan of Egypt, who gave up Jerusalem and the territory around Jaffa and Nazareth, Frederick crowning himself King of Jerusalem. The rest of his life was spent in attempting to bring his rebellious Lombard subjects to subjection, and in struggles with Popes Gregory IX. and Innocent IV. He died suddenly in 1250. Frederick II. was famed for his talents as a minnesinger, for his skill in all knightly exercises, and for his varied learning. He was tolerant in matters of religion, and in his reforms showed himself far in advance of his time. His strong sympathies with his Italian mother-land, and his unremitting endeavors to establish a compact and all-supreme empire in Italy, were the causes, not only of his own misfortunes, but of the miseries which he brought upon Germany; for, by embroiling him in costly wars abroad, they led him to neglect the welfare of his German subjects. Consult: Huillard-Bréholles, *Historia Diplomatica Friderici Secundi* (12 vols., Paris, 1852-1861), the first volume of which gives an excellent account of him; Blondel, *Etude sur la politique de l'empereur Frédéric II. en Allemagne* (Paris, 1892). See HOHENSTAUFFEN.

FREDERICK III. (1415-93). Holy Roman Emperor from 1440 to 1493; as German King, Frederick IV. He was the son of Ernest, Duke of Austria, and was born September 21, 1415. After the death of the Emperor Albert II., in 1439, he was elected his successor in 1440, and two years afterwards he was solemnly crowned at Aix-la-Chapelle. Ten years later he received the Imperial crown at the hands of the Pope. In the Concordat of Vienna with the Papacy, concluded in 1448, in the bringing about of which the Emperor's adviser, Æneas Sylvius (the future Pius II.), had an important share, the Church in Germany sacrificed the advantages obtained by the restrictions imposed upon Papal authority at the Council of Basel. Frederick's only desire was to increase the hereditary possessions of his house. He failed to get the crown of Hungary, to which he laid claim, and even lost possession of Austria for a time, Vienna itself falling into the hands of the Hungarian King, Matthias Corvinus. He did nothing to check the progress of the Turks. He died in 1493, after an inglorious reign of fifty-three years. In 1477 he married his son and successor Maximilian to Mary, the heiress of Charles the Bold of Burgundy. From his time the Imperial dignity continued permanently in the House of Austria. Consult: Æneas Sylvius, *Historia* (Strassburg, 1685); Coxe, *House of Austria* (3d ed., London, 1847).

FREDERICK I. (c.1471-1533). King of Denmark and Norway, from 1523 to 1533. With his elder brother John he was joint ruler of the duchies of Schleswig and Holstein at the time his nephew Christian II. was dethroned (1523). Frederick was elected to succeed him. A long war, waged for the possession of Norway, ended in his favor. He showed great cruelty to his unfortunate relative, whom he detained in close captivity; but he was an able ruler. He embraced the Lutheran faith, which spread in his dominions. He granted the nobility many privileges at the cost of the power of the Crown.

FREDERICK III. (1609-70). King of Denmark from 1648 to 1670. He was the son of King Christian IV., and in his youth held several high ecclesiastical offices, being made Bishop of Verden in 1623 and Archbishop of Bremen in 1634. On the death of his father in 1648 he became King of Denmark and Norway. The country had been reduced by war to a state of great misery, but Frederick nevertheless plunged into a struggle with Sweden (1657) in the hope of regaining the provinces which had been lost by the treaty of Brömsebro in 1645. Poland, Brandenburg, and Holland were his allies. Charles X. of Sweden invaded Jutland, overran Fünen and Zealand, and forced Frederick to sign the Treaty of Roeskilde, February 28, 1658, by which a number of the Danish islands and a portion of Norway were ceded to Sweden. Hostilities were resumed by the Swedes in the same year, but Frederick, with the aid of Brandenburg, succeeded in expelling the Swedes from Jutland, and Charles X. was compelled to raise the siege of Copenhagen in 1659. Abandoned, however, by his allies, Frederick was forced to conclude peace in 1660, on the most unfavorable terms, being obliged to relinquish all claims to the territories which Denmark had possessed in the Swedish part of the Scandinavian peninsula. The latter part of his reign was rendered memorable by the transformation in the nature of the government, which was changed to an hereditary and absolute monarchy by the voluntary act of the commons and clergy, who, out of hatred for the nobility, surrendered to the Crown the liberties and prerogatives which they had hitherto enjoyed.

FREDERICK V. (1723-66). King of Denmark from 1746 to 1766. He was the son and successor of Christian VI., and one of the best and wisest of the absolute monarchs of his time. With the exception of a threatened attack by Peter III. of Russia, nothing disturbed the peace of his reign. Denmark owed to him the increase of her national wealth, and the encouragement of various branches of commerce and manufacture. Frederick established the Asiatic Company, opened the American colonial trade to all his subjects, founded the military academy of Sorö, in Denmark, and caused schools to be opened at Bergen and Trondhjem, in Norway, for the instruction of the Laplanders. He established academies of painting and sculpture at Copenhagen, and sent a number of learned men—among whom was Niebuhr, the father of the historian—to travel and make explorations in the East.

FREDERICK VI. (1768-1839). King of Denmark from 1808 to 1839, and of Norway from 1808 to 1814. He was the son of Christian VII. and Caroline Matilda of England, and assumed the regency in 1784, on account of the insanity of his father, on whose death, in 1808, he ascended the throne. During his reign serfdom was abolished in Denmark and Schleswig-Holstein, monopolies were abrogated, the criminal code was amended, and the slave trade prohibited. All this was largely the work of Frederick's great Minister, Bernstorff (q.v.). In 1800 Denmark joined the armed neutrality of the North, formed against England by Russia, Sweden, and Prussia. This led to the seizure by England of all Danish vessels in British ports, and to the dispatch of a powerful fleet, under Sir Hyde Parker and Nelson, to force the Regent to withdraw from the convention. His refusal was followed by a fierce naval engagement at Copenhagen (April 2, 1801), in which the Danish fleet was almost wholly destroyed. A peace was concluded on the Regent's withdrawal from the confederation; but in consequence of his persistence in maintaining an attitude of neutrality, instead of combining with Great Britain against Napoleon, the war was renewed in 1807 by the appearance before Copenhagen of a British fleet. Copenhagen was bombarded for three days (September 2-5), the arsenals and docks destroyed, and all the shipping disabled, sunk, or carried to England. This blow paralyzed the national resources, and brought ruin on the country. In retaliation Frederick became the ally of Napoleon, and suffered in consequence. In 1814 Norway was taken by the Allies from Denmark and given to Sweden. The State became bankrupt, and many years passed before order could be restored to the finances. Notwithstanding his autocratic tendencies, Frederick so far yielded to the movements of the times as to establish representative provincial councils in 1831-34. He died December 3, 1839. Consult Giessing, *Zur Regierungsgeschichte Friedrichs VI.* (Kiel, 1851-52).

FREDERICK VII. (1808-63). King of Denmark from 1848 to 1863. He succeeded his father, Christian VIII., who died January 20, 1848. The principal events of his reign were the wars and diplomatic negotiations arising out of the revolt of the duchies of Schleswig and Holstein, and the dispute over the succession to Denmark proper and the duchies on the death of the King and of his uncle, the heir presumptive, both of whom were childless. Notwithstanding the heavy expenses of the Schleswig-Holstein War (1848-51), the material prosperity of the country increased during Frederick's reign. See SCHLESWIG-HOLSTEIN.

FREDERICK I. (1657-1713). The first King of Prussia, 1701 to 1713; previous to his assumption of the royal title, Elector of Brandenburg (1688-1701), as Frederick III. He succeeded his father, Frederick William, the Great Elector of Brandenburg, in 1688. His name is a synonym for vanity and extravagance, but his subjects, nevertheless, loved him, and his expenditures did not greatly affect the condition of the national finances. In the first half of his reign his main concern was the acquisition of the royal title, in which endeavor he was assisted by the difficult position of the Emperor Leopold I., who pledged his consent, after a year of negotiation, on the eve of the outbreak of the War of the Spanish Succession. In return for the Imperial permission, Frederick was to furnish a considerable body of troops and in general to further the interests of Austria. His troops helped to win the day for the Allies on more than one occasion, yet at the Peace of Utrecht his only reward was a small district in Gelderland. In this treaty Prussia was, however, recognized in the possession of Neuchâtel, which had fallen to her by inheritance. Frederick I. is remembered to-day as the patron of learned and liberal-minded men—of Spener, Francke, and Thomasius, and, above all of Leibnitz. He is also known as the founder of the Order of the Black Eagle, which is still considered the greatest mark of distinction that a King of Prussia can bestow. Frederick died February 25, 1713. Consult: Henderson, *Short History of Germany* (New York, 1902); Pierson, *Preussische Geschichte* (Berlin, 1898); Tuttle, *History of Prussia* (Boston, 1884-88).

FREDERICK II. (1712-86). King of Prussia from 1740 to 1786, known as THE GREAT. He was born January 24, 1712, and was the son of Frederick William I. (q.v.) of Prussia and of Sophia Dorothea, daughter of George I. of England. The plan of education pursued by his father soon tended to render their relations unbearable. Frederick William insisted on instilling into his son his own practical instincts, and stifled the literary and artistic impulses which Frederick manifested at an early age. For the son's faults, his inclination to extravagance and self-indulgence, the father had nothing but the harshest repressive measures. At last Frederick determined to escape the parental tyranny by flight to England. The plot was discovered, and the most severe punishment followed. Frederick's aider and abettor, Lieutenant Katte, was beheaded before his eyes, and the Prince himself was led to expect a similar fate. The father, however, relented, and Frederick was placed, instead, in the War and Domain Bureau at Cüstrin, and made to work as an assistant clerk. Here he learned most valuable lessons with regard to the task of administering a great kingdom. A reconciliation finally took place between father and son. The only act which Frederick never forgave his father was his forced marriage, for reasons of State policy, with Elizabeth of Brunswick-Bevern, whom he respected but never loved.

Frederick's great wars fall in the first half of his reign. Almost immediately after his accession, on the news of the death of the Emperor Charles VI., and the accession of his daughter, Maria Theresa, in the Hapsburg dominions, he invaded Silesia, basing his claim to a large part of the country on an old transaction in which Austria had played a grasping and dishonest part. (See SUCCESSION WARS.) In the first battle of the Silesian campaign—that of Mollwitz, April, 1741 — Frederick's General (Schwerin) found the situation so critical that he urged the King to fly for his life, and Frederick did not know until the next day that he had won the victory. Mollwitz gained for Frederick the French alliance, and practically decided the campaign. After the victory of Frederick at Chotusitz, Maria Theresa agreed to the Peace of Breslau (1742), in which France, however, was not included. In this treaty Austria ceded most of Silesia to Prussia. Two years later Frederick reëntered the struggle, ostensibly as the champion of the Emperor, the Bavarian Charles VII. France was still his ally, while Maria Theresa could count on England, Saxony, and Holland. Frederick took Prague, but was forced to abandon the city and make a disastrous retreat. He soon retrieved his fortunes, however, at Hohenfriedberg (June, 1745), and his victory over the Saxons at Kesseldorf (December, 1745) was followed by the Treaty of Dresden, which was a repetition of the Peace of Breslau. In 1756 Maria Theresa, inconsolable for the loss of Silesia, formed an alliance against Prussia with France (the old enemy of the Hapsburgs), Russia, Saxony, and Sweden. England, as the enemy of France, now sided with Frederick. The King of Prussia at once descended upon Saxony, thus opening the great struggle which involved all the European powers and their colonies. (See SEVEN YEARS' WAR.) The outcome of this gigantic conflict, which was the culmination of Frederick's military career, but which taxed the resources of his little kingdom to their utmost, left Prussia in 1763 territorially unchanged, and in the enjoyment of great military prestige.

Frederick had come through the war without incurring a national debt or increasing the direct taxes; on the other hand, he had inflated the currency; but by wise measures he soon put the finances of Prussia on a sound basis. He practiced the most rigid economy in the royal household, and was enabled to spend large sums in agricultural and industrial improvements. He reclaimed thousands of acres of waste land by a system of canals and drainage, peopled them with colonists, and set on foot a large number of industries, visiting at intervals every part of his dominions. He began a codification of the law, abolished serfdom within the royal domains, insisted on the impartial administration of justice, granted freedom of speech, and, at least in literary and scientific matters, liberty of the press. Tolerant toward every form of religious belief, he was one of the most intolerant of autocrats toward his Ministers. To his enlightened despotism were due the regulation of customs and the equalization of taxation. He grimly put a tax on the hired Hessians that passed through his dominions, as 'on cattle bought and sold.' Frederick took a great interest in the American Revolution, and admired and appreciated the greatness of Washington, and was one of the first sovereigns to conclude a commercial treaty with the United States. The desertion of Prussia by England at the critical period in the Seven Years' War had inspired in Frederick a bitterness toward the latter country which permanently influenced his foreign policy. On the other hand, he had drawn closer to Russia after the death of his uncompromising enemy, the Empress Elizabeth, and he and Catharine II. were able to see their value as allies to each other; hence the partition of Poland.

Frederick's relation to the intellectual development of Germany was peculiar. Although Prussia had become through him one of the great Continental powers, he had no sympathy whatever with German national aspirations. While he foresaw the future literary greatness of Ger-

FREDERICK THE GREAT
FROM A PAINTING BY GEORG MEYN

many, he ignored the eminent writers who were appearing upon the scene, and despised the German language, which he never wrote with ease. French he spoke and wrote fluently, though he did not spell it correctly. He cultivated the society of French writers and scholars, among them Voltaire and Maupertuis, whom he invited to Sans Souci. He was consistent in his admiration of Voltaire, though not blind to his personal weaknesses. Conversation with his literary friends, and playing on the flute, on which he was a really skillful performer, were Frederick's only relaxation from incessant work. He was a voluminous writer. Of his numerous works, the most important are: *Mémoires pour servir à l'histoire de Brandebourg; Histoire de la guerre de Sept Ans;* and the *Anti-Macchiavel*, written before he became King, in which he laid down his views on government. The Berlin Academy published an edition of his collected works, in thirty volumes, edited by Preuss (1846-57).

Throughout his reign Frederick took the greatest interest in the improvement of the Prussian Army. He wrote for the guidance of his generals a number of works covering the whole science of war; and the army, which numbered 80,000 men when he ascended the throne, had been increased to nearly 200,000 in his lifetime. Frederick died August 17, 1786, at Sans Souci.

Consult: Tuttle, *History of Prussia Under Frederick the Great* (3 vols., Boston, 1888), the best work in English, unfortunately cut short at 1757 by the death of the scholarly author; Longman, *Frederick the Great and the Seven Years' War* (New York, 1881), a useful little compendium. Carlyle, *History of Frederick II.* (London, 1888), is, on the whole, inadequate as history. These are the principal useful works in English. The greatest living authority is Koser, whose *Friedrich der Grosse als Kronprinz* (Stuttgart, 1901) is a small classic. His larger history is nearing completion. See also Lavisse, *La jeunesse du grand Frédéric* (Paris, 1891), and *Le grand Frédéric avant l'évènement* (Paris, 1893); Preuss, *Friedrichs des Grossen Lebensgeschichte* (Berlin, 1832-34); Kugler, *Geschichte Friedrichs des Grossen* (12th ed. Leipzig, 1887); and numerous other general and special studies, a bibliography of which may be found in Lavisse and Rambaud, *Histoire générale*, vol. vii. (Paris, 1893-1900).

FREDERICK III. (1831-88). Emperor of Germany and King of Prussia from March 9 to June 15, 1888. Before his accession to the throne he was known as Frederick William. He was the only son of William I., King of Prussia and first Emperor of united Germany, and was born October 18, 1831. His earnest character and decided talents were developed under the care of excellent masters, among others Ernst Curtius (q.v.), who accompanied him to the University of Bonn, where the Prince was matriculated in the law faculty. After the completion of his education, the Prince visited several foreign countries. In England he became attached to the Princess Royal, Victoria, to whom he was married, January 25, 1858. The marriage was highly approved by both nations, and the life of the royal couple was an exceedingly happy one. After his father's accession to the throne, the Crown Prince took part in the more important affairs of the State. During the war with Denmark in 1864 he was sent to the scene of operations in order to exert his personal influence toward removing the friction among those in charge of affairs. In the war with Austria in 1866 he commanded the Second Prussian Army, and by a forced march arrived on the scene of the battle of Sadowa in time to decide the issue. In the Franco-German War he commanded the Third Army, consisting of the South German forces. He won the first victory of the war, that of Weissenburg (August 4th), and inflicted a decisive defeat on the army of MacMahon at Wörth (August 6th). Seconded by the Crown Prince of Saxony, he vanquished MacMahon at Sedan, and compelled him to surrender with his whole army (September 2d). Two weeks later he began the investment of Paris, and had the principal share in its reduction. He played a considerable part in the founding of the new German Empire, although his plans differed in some essential respects from those advocated by Bismarck. During the Emperor's illness, caused by an assassin's shot in 1878, his public functions were discharged by the Crown Prince, who showed great ability in the performance of his duties. In January, 1887, he was attacked by a cancerous throat trouble, necessitating several surgical operations, which were heroically borne. On the death of his father, March 9, 1888, he ascended the throne as Frederick III. He died June 15th of the same year. Liberal, cultivated, and a friend of parliamentary government, he was greatly beloved by all, especially by the army, and bore the popular appellation of "Unser Fritz." He wrote diaries of his travels in the East, and of his part in the wars of 1866 and 1870-71. He had eight children, the eldest of whom is the reigning Emperor, William II. (q.v.).

FREDERICK I. (1425-76). Elector Palatine, called the Victorious. At the death of his father, in 1439, a portion of the Palatinate devolved upon him, which he later ceded to his brother, Louis IV. In 1449, upon the death of Louis, he assumed the guardianship of his infant nephew Philip, and administered the Government. In 1451 the country, being troubled by warlike neighbors, Frederick persuaded the estates to invest him with the dignity of Elector for life, with the understanding that his children should not rank as princes, and that the succession should devolve upon his nephew. A coalition was at once formed against him, headed by the Emperor Frederick III.; but he defended himself ably, and in 1462 won a great victory over his enemies at Seckenheim. His success secured him undisturbed possession of his principality until his death. The territory of the Palatinate was greatly increased during his reign.

FREDERICK II. (1482-1556). Elector Palatine, surnamed the Wise. He was the fourth son of Philip the Magnanimous, and assumed the Electoral crown in 1544, succeeding his brother Louis. When, in 1529, the Sultan Soliman besieged Vienna, Frederick assumed command of the Imperial army. In 1535 he married Dorothea, daughter of Christian II., ex-King of Denmark. Through the teaching of Melanchthon he became familiar with the principles of the Reformation, and joined the Schmalkald League. In later life he signed the Augsburg Interim.

FREDERICK III. (1515-76), Elector Palatine, surnamed the Pious. He succeeded his father, John II., in the ducal possessions of the Simmern Palatinate in 1557, and upon the extinction of the elder Palatine line became Elector Palatine in 1559. From Lutheranism, which he embraced in 1546, he passed over in 1561 to Calvinism, and by his energetic measures to impose his belief upon his subjects aroused the hatred of the Lutheran princes. As a fervent champion of Protestantism he lent aid to the adherents of the reformed religion in France and in the Netherlands. He laid the foundation of systematic Calvinism by causing the Heidelberg Catechism to be drawn up in 1653, devoting his personal attention to the work.

FREDERICK IV. (1574-1610). Elector Palatine, surnamed the Upright. He was the son of the Elector Louis VI. and Elizabeth of Hesse. His father died during his infancy, and Frederick succeeded to the throne in 1583, under the guardianship of his uncle, John Casimir, but only assumed the reins of government in 1592, upon his uncle's death. The steadfast and firm support he accorded to the Protestant cause renders his reign important. Through his influence the Protestant Union was formed in 1608. He raised Mannheim, where many Protestants had taken refuge, to the dignity of a town.

FREDERICK V. (1596-1632). Elector Palatine and King of Bohemia. He was the third son of the Elector Frederick IV., whom he succeeded in the Palatinate in 1610. He married, in 1613, Elizabeth, the daughter of James I. of England, through whose ambitious counsels he was induced to take a prominent part in the proceedings of the union of the Protestant princes of Germany, and finally, although against his own inclinations, to accept the dignity of King of Bohemia in 1619. His complete defeat at the battle of the White Hill, November, 1620 (see Thirty Years' War), terminated his short-lived enjoyment of the regal crown, of which he retained no other memorial than the mocking title of 'the Winter King.' The rest of his life was spent in exile, under the ban of the Empire, and with no resources beyond those which he could obtain from the generosity of his friends. In 1623 he was declared to have forfeited his Electoral title and his dominions in the Palatinate. The Electoral dignity and the Upper Palatinate were conferred upon his cousin, Maximilian of Bavaria, the head of the Catholic League. Frederick's daughter Sophia became the wife of the first Elector of Hanover and the mother of George I. Her daughter married Frederick I. of Prussia, and was the grandmother of Frederick the Great. Consult Gindely, *Geschichte des dreissigjährigen Krieges* (Prague, 1869-80).

FREDERICK I. (1372-1440). First Elector of Brandenburg, of the House of Hohenzollern, originally Frederick VI., Burgrave of Nuremberg. After serving in the Hungarian Army he married, in 1401, Elizabeth of Bavaria, whose beauty and accomplishments were widely celebrated. As a reward for the support which he gave to Sigismund as candidate for the Imperial crown, he was given possession of Brandenburg in 1415, and in 1417 was invested with the Electoral dignity, thus becoming the founder of the royal Prussian dynasty.

FREDERICK III., Elector of Brandenburg. See Frederick I., King of Prussia.

FREDERICK I. (1369-1428). Elector and Duke of Saxony, called the Pugnacious. He was the son of Frederick the Stern, of Meissen. With his two brothers he succeeded, on the death of the father, in 1381, to the inheritance; but they were compelled to divide with their two uncles. Frederick distinguished himself as a soldier, and in 1423, in recognition of his successes against the Hussites, Emperor Sigismund made him Elector and Duke of Saxony. He was defeated by the Hussites at Aussig, in 1426. He founded the University of Leipzig, in 1409.

FREDERICK III. (1463-1525). Elector and Duke of Saxony, called the Wise. He was a grandson of Frederick II., and succeeded his father, Duke Ernest, in the Government. He founded the University of Wittenberg in 1502, and called Luther and Melanchthon to chairs in the faculty. He never adopted the creed of the Reformers, but he accorded them toleration, protected Luther at the Diet of Worms, and sheltered him in the castle of Wartburg. In 1493 he visited the Holy Land, and in Jerusalem was made a Knight of the Sepulchre. He brought about many reforms in the constitution of the Empire, and on the death of Maximilian I., in 1519, he was offered the Imperial throne, but declined it, and recommended Charles I. of Spain, who became Emperor as Charles V. Consult Kolde, *Friedrich der Weise und die Anfänge der Reformation* (Erlangen, 1881).

FREDERICK II. (1720-85). Landgrave of Hesse-Cassel. He succeeded to the Government in 1760. He contributed greatly to the improvement and embellishment of the city of Cassel, which owes its Museum, its Academy of Fine Arts, and a number of the fine buildings which are at present its chief pride and boast, to him. In order to provide for his lavish expenditures, he sold a corps of 12,000 soldiers to England during the war of that country with the American colonies.

FREDERICK II., called Prince of Homburg (1633-1708). A German general, Landgrave of Hesse-Homburg. He entered the Swedish service, and fought with great distinction at the siege of Copenhagen in 1659. It was, however, in the service of Brandenburg that he achieved the greatest celebrity. He was made general of cavalry by the Great Elector, Frederick William, and had a great share in the victory over the Swedes in Fehrbellin in 1675. In 1681 he succeeded his brother in Hesse-Homburg. The complete restoration of Homburg, now one of the most beautiful spas of Germany, was chiefly due to him.

FREDERICK I., William Charles (1754-1816). Duke and subsequently first King of Württemberg. He was born at Treptow, Pomerania, and was a son of the famous Sophia Dorothea, niece of Frederick the Great. After serving in the Prussian and Russian armies, he in 1797 succeeded to the dukedom, and in 1803 was invested with the Electoral dignity. At the close of 1805, Napoleon, in reward for his alliance against Austria, erected his State into a kingdom, and on January 1, 1806, Frederick assumed the royal title. He soon afterwards joined the Confederation of the Rhine. Although the territory over wich he ruled was greatly enlarged during his reign, his autocratic government and subserviency to Napoleon I. found little favor among his subjects, upon whom the oppressive conditions imposed by enforced conscription, excessive taxation, and other evils weighed most heavily. Frederick joined the league against France after the battle of Leipzig.

FREDERICK I., William Louis (1826—). Grand Duke of Baden. He was born at Karlsruhe, son of the Grand Duke Leopold and of Princess Sophia of Sweden. He was educated at the universities of Heidelberg and Bonn, and, after acting as Prince Regent for four years, succeeded to the Government in 1856. Immediately upon his accession to the throne he restored the Constitution of the grand duchy, and during a Government of nearly fifty years he has zealously endeavored to promote economic and educational progress. He sided with Austria in the war of 1866, but after the defeat of that power he deemed it best to enter into close relations with Prussia and the North German Confederation.

FREDERICK AUGUS′TUS I. (1750-1827). Elector (as such Frederick Augustus III.), and from 1806 first King of Saxony. He was the son of the Elector Frederick Christian, and succeeded his father under the guardianship of his uncle, Prince Xavier, in 1763. In 1768 he was declared of age. In 1769 he married Princess Maria Amelia of Zweibrücken. He sided with Frederick the Great against Austria in the War of the Bavarian Succession (1778-79), and afterwards joined the League of German Princes. In 1791 he was offered the crown of Poland, but declined it. In 1792 he reluctantly took up arms against France. During the war between France and Austria, in 1805, he maintained a strict neutrality; but in the following year he joined Prussia against France. The disastrous battle of Jena forced him to conclude a treaty of alliance with Napoleon, December, 1806. He was allowed to assume the royal title, and joined the Rhenish Confederation. In 1807 he was invested with the newly created Duchy of Warsaw, but was ruler of it only in name, the control being exercised by Napoleon himself. During the subsequent wars of Napoleon he was a faithful ally of the Emperor. He was taken prisoner by the Allies after the entry into Leipzig, October 19, 1813, and by the decrees of the Congress of Vienna he was compelled to cede more than half of his kingdom to Prussia. He devoted the remainder of his life to the development of the agricultural, commercial, and industrial resources of his kingdom, and directed his attention especially to the administration of justice. He died at Dresden, May 5, 1827.

FREDERICK AUGUSTUS II. (1797-1854). King of Saxony from 1836 to 1854. He was the eldest son of Prince Maximilian of Saxony, and brother of Frederick Augustus I., and of Caroline Maria Theresa of Parma. In 1830, on the outbreak of political disturbances in Dresden, he was named joint Regent of the kingdom with King Anthony, and his wise measures speedily quelled all discontent. In 1836 he succeeded Anthony on the throne. In spite of the enlightened liberality of his administration, Saxony was not to escape the political troubles which assailed Germany in 1848. An insurrection in Dresden in May, 1849, obliged him to avail himself of the help of Prussian troops. But the rising once quelled, his reign continued tranquil and prosperous. He died as the result of a fall from his carriage while traveling in Tyrol, August 9, 1854.

FREDERICK CHARLES (1828-85). Prince of Prussia. He was the only son of Prince Charles, brother of Emperor William I., and was educated at Bonn. He served with distinction in the early stage of the first Schleswig-Holstein war, which began in 1848. He next took part in the suppression of the revolutionary struggle in Baden in 1849, after which he devoted himself assiduously to the study of military science. Some time afterwards he delivered a lecture entitled "Die Kampfweise der Franzosen," which subsequently appeared in the form of a treatise, and was republished in France as *L'Art de combattre l'armée française* (1860). During the Danish War of 1864 he won laurels by storming the fortifications at Düppel (April 18, 1864), and in the following month he was intrusted with the chief command of the allied forces. He was commander of the First Division of the army during the conflict with Austria (1866), and after winning the skirmishes of Podol, Münchengrätz, and Gitschin in rapid succession, obstinately defended the Prussian centre at the battle of Sadowa until the arrival of the army of the Crown Prince. Still more conspicuous was his leadership during the Franco-German War of 1870-71, when he commanded the Second Army, consisting of six army corps, 500 guns, and 260,000 men. He defeated Bazaine at Vionville (Mars-la-Tour) on August 16, 1870, and two days later, seconded by General Steinmetz, at Gravelotte, ultimately compelling Bazaine to capitulate with his army of about 180,000 men, and to surrender the fortress of Metz (October 27th). He subsequently defeated the Army of the Loire, under General Aurelle de Paladines, after a campaign of six weeks. After the war he became inspector of Prussian cavalry.

FREDERICK FRAN′CIS II. (1823-83). Grand Duke of Mecklenburg-Schwerin. He was a son of Grand Duke Paul Frederick and of the Princess Alexandrine of Prussia, and was educated at Bonn. He ascended the throne in 1842, and in the same year he was appointed general in the Prussian Army, in which capacity he fought with distinction in the War of 1866. As commander of the Thirteenth Army Corps he participated in the siege of Metz (1870), and subsequently invested the fortress of Toul, which surrendered on September 23, 1870. In December he distinguished himself in the operations on the Loire. During the siege of Paris, where he commanded the divisions guarding the approaches to the besieging army, he acted for some time as chief of the General Staff. A magnificent monument was erected to his memory at Schwerin, in 1893.

FREDERICK LOU′IS (1707-57). Prince of Wales. He was born at Hanover, Germany, the eldest son of George II. and Queen Caroline. He came to England at the age of seventeen, was appointed Prince of Wales in 1729, and married the Princess Augusta of Saxe-Gotha in 1736. He is described as of a generous but dissolute and unreliable character. His son afterwards came to the throne as George III.

FREDERICK WIL′LIAM (1620-88). Elector of Brandenburg from 1640 to 1688, commonly called the Great Elector. He was the son of the Elector George William, and was born February 16, 1620. On his accession he found an empty exchequer, the towns and cities depopulated, and the whole electorate devastated by the ravages of the Swedish and Imperialist armies during the Thirty Years' War, which was not yet concluded. A portion of his inheritance had even been seized by the Swedes. His first acts were to regulate the finances, and to conclude a treaty of neutrality with Sweden, which left him at leisure to devote himself to the organization of his army and the repeopling of the deserted towns and villages by means of immigration. By the Treaty of Westphalia, in 1848, he secured Further Pomerania (east of the Oder), and received the bishoprics of Halberstadt, Minden, and Kammin as lay principalities, together with the reversion of the See of Magdeburg. In the course of ten years he had, by the help of his generals, Derfflinger, Schomberg, and Kannenberg, created an army of 25,000 men, organized on the Swedish model. In 1656 he entered into an alliance with Charles X. of Sweden against Poland, and coöperated with him in the taking of Warsaw. In the following year he forsook the Swedish alliance, and placed himself on the side of Poland, which, in the Treaty of Wehlau, renounced its suzerainty over the Duchy of Prussia. The aggressions of Louis XIV., who sought to extend the French dominions to the Rhine, and made an onslaught upon Holland, alarmed the Elector, who induced the Emperor Leopold I., the King of Denmark, and the Elector of Hesse-Cassel to enter into a league against France (1672). The result was unfavorable to the cause of the German princes, and Frederick William was obliged to content himself with making highly disadvantageous terms in the following year. The war was soon renewed, and Brandenburg was again laid open to the incursions of the Swedes, who, at the instigation of Louis XIV., advanced upon Berlin, laying waste everything on their march. The Elector, who had taken up his winter quarters in Franconia, hurried across the Elbe at the head of his cavalry, and signally defeated the Swedes at Fehrbellin (June 18, 1675), driving them from his dominions. Deserted, however, by the other German princes, and his dominions overrun by the troops of Louis, he was obliged to agree to the Treaty of Saint-Germain, by which he restored all his conquests to the Swedes, in return for the withdrawal of the French army and an indemnity of 300,000 crowns. After this Frederick William devoted himself to the task of furthering the prosperity of his dominions. By his reception of 20,000 French Protestants, after the revocation of the Edict of Nantes (q.v.), and the encouragement which he afforded to the immigration of Hollanders and other foreigners, he augmented the population of his States, and introduced numerous industries among his subjects. He founded the University of Duisburg and the Royal Library at Berlin, and reorganized the universities of Frankfort-on-the-Oder and Königsberg. He opened canals, established a system of posts, and greatly enlarged and beautified Berlin. He left a well-filled exchequer and a highly organized army. Consult: Tuttle, *History of Prussia, 1134-1740* (Boston, 1884); Hiltl, *Der grosse Kurfürst und seine Zeit* (Bielefeld, 1893); Philippson, *Der grosse Kurfürst* (Berlin, 1897-1902).

FREDERICK WILLIAM (1771-1815). Duke of Brunswick. He entered the Prussian service in 1788, and was actively engaged with the army during the war with France, which began in 1792, and after the battle of Auerstädt, in which his father was mortally wounded, but in which the son took no part, was taken prisoner at Lübeck (November 7, 1806). On the death of his eldest brother he would have succeeded to the dukedom, had not Napoleon put a veto on his accession. Frederick William joined Austria in the war against Napoleon in 1809. He raised a corps of volunteers in Bohemia, invaded Saxony, and, reinforced by an Austrian detachment, took Dresden and Leipzig. The defeat of the Austrians at Wagram left him isolated in Central Germany, and he determined to make for the North Sea and England. With 1500 men he set out from Leipzig (July 20th), passed through Brunswick, where he overthrew 4000 Westphalians under Reubel, crossed the Weser, reached Elsfleth, seized all the available shipping and sailed for England (August 7th). He was received with enthusiasm, entered the English service with his men, and afterwards took part in the War of the Peninsula, where he served with distinction till his return to his own dominions in 1813. His attempts to maintain an excessive army and to force reforms upon his people made him very unpopular. He joined the allied army with a force of 8000 men after the return of Napoleon from Elba, and fell while leading his men at Quatre-Bras, on June 16, 1815.

FREDERICK WILLIAM I. (1688-1740). King of Prussia from 1713 to 1740. He was the son of Frederick I., and was born August 15, 1688. He was in almost every particular the opposite of his father—simple and almost penurious in his habits, attending to business, passionately fond of military exercises, averse to culture, fond of the society of the low and illiterate, and carrying to the utmost his ideas of arbitrary power and the divine right of kings. The public events of his reign were of little importance. From Charles XII. of Sweden he wrested a great part of Hither Pomerania, including Stettin, playing a rôle which he himself confessed was not fit for an honest man. He died at Potsdam, May 31, 1740. As the founder of an administrative system, of which he himself worked out the minutest details, Frederick William stands prominent among the monarchs of his century. By his economy and reforms in the finances he was able to indulge his taste for the organization of military forces. His childish love for tall soldiers induced him to resort to the most flagrant outrages, both at home and abroad, for kidnaping tall men and forcing them into his service. The result of this system, which was greatly moderated toward the end of his reign, was that he left at his death a well-drilled army of 80,000 soldiers. What was of more consequence to his son and successor was that his exchequer contained 9,000,000 thalers, and that his kingdom had attained an area of more than 45,000 square miles and a population of upward of 2,200,000. Consult: Tuttle, *History of Prussia, 1134-1740* (Boston, 1884); Förster, *Geschichte Friedrich Wilhelms I.* (Potsdam, 1835); Carlyle, *History of Friedrich II., called Frederick the Great* (London, 1858-65).

FREDERICK WILLIAM II. (1744-97). King of Prussia from 1786 to 1797. He was the son of Prince Augustus William of Prussia, the brother of Frederick the Great, and was born September 25, 1744. During his reign Prussia declined, owing to his indolence and lack of political sagacity. He gave himself up to sensuality and to the mystic vagaries of the Rosicrucians. He contracted four marriages, besides making no secret of his relations with the Countess Lichtenau. His good nature led him to abrogate taxes which the country could hardly spare; a futile expedition into Holland, in support of the Stadtnolders, cost him 6,000,000 thalers; and his efforts, in conjunction with Austria, to uphold royalty in France, resulted, after a war lasting from 1792 to 1795, in the cession to France, by the Treaty of Basel, of the Prussian territories west of the Rhine. Frederick William II. shared in the second and third partitions of Poland (1793, 1795), by which Prussia received large accessions of territory. Consult Treitschke, *Deutsche Geschichte im XIXten Jahrhundert* (Leipzig, 1878-95).

FREDERICK WILLIAM III. (1770-1840). King of Prussia from 1797 to 1840. He was the son of Frederick William II., and was born August 3, 1770, at Potsdam. On his accession in 1797 he dismissed the favorites of the preceding reign, and entered upon a tour of inspection through the numerous provinces of his kingdom, for the purpose of investigating their condition. But though Frederick William was well intentioned, he lacked the force of will to cope with the difficulties of his position. By his efforts to maintain an attitude of neutrality in the great European struggle following upon the French Revolution, he awakened the distrust of the powers of Europe, and disappointed the petty German princes, who had looked upon Prussia as their protector against French aggression. In the reconstitution of the German Empire after the Peace of Lunéville (1801), Prussia acquired the sees of Hildesheim, Paderborn, and Münster, as a compensation for her territories west of the Rhine wrested from her by France. The repeated and systematic insults of Napoleon, who despised Frederick William while he professed to treat him as a friend, roused the spirit of the nation, and the King saw himself obliged to agree to a convention with Russia, the real object of which was to drive Napoleon out of Germany. But when Napoleon marched against Austria in 1805, Frederick William remained inactive. After the battle of Austerlitz (December, 1805), he even entered into a convention with Napoleon, by which Prussia gave up Anspach, Bayreuth, Cleves, and Neuchâtel, and received more than their equivalent in Hanover, wrested by Napoleon from the English dynasty. The affronts of Napoleon were redoubled after this fresh proof of Frederick William's indecision. The Prussian nation, headed by the Queen, the beautiful Louisa of Mecklenburg-Strelitz, now called loudly for war, and the King yielded. The Prussian Army was annihilated in the battles of Jena and Auerstädt, fought on the same day (October 14, 1806), and the French overran the kingdom. The Russian armies advanced to the aid of Prussia. The indecisive battle between the Allies and the French at Eylau (February 7, 8, 1807) was followed by the victory of Napoleon over the Russians at Friedland (June 14), which left Prussia at the mercy of the conqueror. In the Treaty of Tilsit, July 9, 1807, Prussia was almost dismembered, being forced to give up her possessions west of the Elbe and the Polish dominions acquired in 1793 and 1795. During the next few years Prussia remained almost effaced as a European power, and Napoleon seized every opportunity of humbling Frederick William. But during this period of humiliation the King and his people were quietly undertaking the task of regeneration. The utmost energy was displayed in every branch of the administration. Frederick William's great Minister, Stein, emancipated the serfs and inaugurated local self-government in the towns. Scharnhorst and Gneisenau reorganized the army, training in secret three times as many men as were allowed by treaty with Napoleon. The disastrous termination of Napoleon's Russian campaign was the turning-point in the fortunes of Prussia. At the beginning of 1813 the German people rose in arms against France, Frederick William entering into an alliance with Russia. Napoleon was victorious at Lützen and Bautzen, May, 1813. Austria now took up arms against France, and the battle of Leipzig, October, 1813, achieved the liberation of Germany. Prussia joined in the invasion of France, and her armies entered Paris. The Congress of Vienna restored to Prussia a great part of her former possessions, and among her acquisitions were half of the Kingdom of Saxony and large territories in the Rhineland. The part played by Blücher at Waterloo determined Prussia's rank among the great military powers of Europe. The Prussian people, however, were doomed to disappointment in the erection of a new era of liberal government. In 1815 Frederick William joined Czar Alexander I. and the Emperor Francis of Austria in the formation of the Holy Alliance, the chief object of which soon showed itself to be the maintenance of absolutism. The Prussian King played into the hands of Metternich, who directed the policy of the Holy Alliance. Frederick William III., however, did much for the material advancement of his realm. In his reign the Zollverein, or customs union, was established, which at the time of his death included the bulk of the German States, exclusive of Austria. He died June 7, 1840. Consult: Treitschke, *Deutsche Geschichte im XIXten Jahrhundert* (Leipzig, 1886-95), especially vol. i. See GERMANY; PRUSSIA; GNEISENAU; STEIN; SCHARNHORST.

FREDERICK WILLIAM IV. (1795-1861). King of Prussia from 1840 to 1861. He was the son of Frederick William III., and was born October 15, 1795. He received a careful education, and was fond of the society of learned men. He ascended the throne June 7, 1840. He exhibited much of his father's vacillation and instability of purpose; and although he began his reign by granting minor reforms and promising radical changes of a liberal character, he always, on one plea or another, evaded the fulfillment of these pledges. He had high but vague ideas of 'the Christian State,' and showed through life a strong tendency to mystic pietism. Equally vague was his dream of a Germany united under a 'college of kings' ruling by divine right. A step in the direction of popular government was taken in 1847 by the convocation of the so-called 'United Diet,' whose activity, however, was to be merely that of an advisory body. The February Revolution in France in 1848 was followed by an outbreak in Prussia which shook the throne of the Hohenzollern to its foundations. On March 18 the people of Berlin rose in arms. To save his crown, the King yielded to the demand for constitutional reform. In May a national Constituent Assembly met, at the same time that the Frankfort Parliament assembled to reorganize the political system of Germany. On February 26, 1849, the new Prussian Chambers met, but the constitutional régime thus inaugurated was granted merely as the King's free gift, to be modified at his pleasure. On March 28, 1849, the Frankfort Parliament offered the Imperial crown of Germany to Frederick William, but he declined it. (See GERMANY.) In the meanwhile the King had been forced, in 1848, by the clamor of his subjects, to take up arms in support of the people of Schleswig-Holstein in their revolt against Denmark, but Prussia soon abandoned the cause of the duchies. After the complete cessation of the revolutionary movement in Germany, the reactionary régime was in full sway. The 'pietists' regained their former influence at Court, and the freedom of the press and of religious and political opinion was strictly circumscribed. In 1857 Frederick William was seized with intermittent attacks of insanity, and in 1858 he resigned the management of public affairs to his brother and heir, Prince William, who acted as regent of the kingdom till his accession, on the death of Frederick William, which occurred January 2, 1861. Consult Biedermann, *Dreissig Jahre deutscher Geschichte* (Breslau, 1896).

FREDERICK WILLIAM I. (1802-75). Elector of Hesse. He was educated at Marburg and Leipzig, and became co-regent in 1831, and Elector in 1847. He sided with Austria during the War of 1866, and his refusal to accede to the terms of Prussia led to the invasion of his territory. In consequence of his obstinate refusal to treat with the Prussian Government, he was arrested and conveyed to the fortress of Stettin, and his territories were annexed by Prussia.

FREDERICK, CHRISTIAN AUGUST (1829-80). Duke of Schleswig-Holstein-Sonderburg-Augustenburg, and claimant to the duchies of Schleswig and Holstein. He was born on the island of Alsen, and was educated at Bonn. After the unsuccessful revolt of Schleswig-Holstein against Danish rule, the ducal family was banished. Frederick enjoyed great popularity with the people, however, and when, after the war of 1864, the rule of Denmark in the duchies was terminated, he triumphantly entered Kiel, where he was eagerly welcomed. Numerous political complications now arose which prevented the formal reinstatement of the dynasty. By the terms of the Treaty of Vienna (October, 1864), the duchies had been relinquished to Prussia and Austria, to be disposed of by them. Prussia, however, was not inclined to permit the creation of a new German State, and imposed conditions upon Frederick which made it impossible for him to assume the government. After the Peace of Prague, which terminated the Austro-Prussian War of 1866, the lands were finally absorbed into the Kingdom of Prussia. Frederick subsequently served on the staff of the Crown Prince, Frederick William of Prussia, during the Franco-German War of 1870-71. His daughter, Augusta Victoria, became the wife of Emperor William II. of Germany.

FRED'ERICKSBURG. The county-seat of Gillespie County, Texas, 80 miles west of Austin and 25 miles north of Comfort, the shipping point, on the San Antonio and Aransas Pass Railroad (Map: Texas, E 4). Stock-raising and farming are the leading industries, and there are some manufactures. A German colony founded Fredericksburg in 1846. Population, about 1800.

FREDERICKSBURG. A city in Spottsylvania County, Va., 60 miles north of Richmond; on the Rappahannock River at the head of tidewater, and on the Potomac, Fredericksburg and Piedmont and the Richmond, Fredericksburg and Potomac railroads (Map: Virginia, G 3). The city lies in a valley inclosed by high hills, and has a public library, several bridges across the river, a beautiful park, and the famous Stonewall, Confederate, and National cemeteries, the last having 15,300 graves. It is the seat of Fredericksburg College (Presbyterian) opened in 1893. A dam above the city, 900 feet long and 18 feet high, affords valuable water-power; and there are manufactures of flour, silk and woolen goods, iron, shoes, shirts, pickles, cigars, sumac, carriages, wheels, hubs, spokes, tanned leather, and excelsior. Fredericksburg is governed under a revised charter of 1871 which provides for a mayor, elected biennially, and a unicameral council. The city owns and operates its waterworks and gas and electric-light plants. Population, in 1890, 4528; in 1900, 5068. On the site of Fredericksburg, Captain John Smith fought a skirmish with the Rappahannock Indians in 1608. The town was named in 1727 in honor of the Prince of Wales, and was incorporated in 1782. It was the home of Gen. Hugh Mercer, killed in the battle of Princeton, and of the Revolutionary officers George Weedon, William Woodford, and Gustavus B. Wallace. An imposing monument has been erected in honor of Washington's mother, who died here in 1789. During the Civil War Fredericksburg changed hands several times, and was the scene of several battles. See FREDERICKSBURG, BATTLE OF; and CHANCELLORSVILLE, BATTLE OF.

FREDERICKSBURG, BATTLE OF. An important battle of the Civil War in America, fought on December 13, 1862, at Fredericksburg, Va., between the Federal Army of the Potomac, numbering about 116,000, under General Burnside, and the Confederate Army of Northern Virginia, numbering about 78,000, under General Lee. On November 15th Burnside, who, on November 7th, three weeks after the battle of Antietam, had superseded McClellan as commander of the Army of the Potomac, then stationed near Warrenton, Va., started down the left bank of the Rappahannock with the intention of crossing at Fredericksburg, where he expected General Halleck to have pontoon bridges in readiness, and of marching thence on Richmond. The Right Grand Division under Sumner arrived at Falmouth, near Fredericksburg, on the 17th, but could not effect a crossing, owing to the absence of bridges, and was accordingly stationed on Stafford Heights, opposite Fredericksburg. Hooker and Franklin, commanding the Centre and Left Grand Divisions, arrived soon afterwards. Meanwhile, Longstreet, acting under orders from Lee, hastened to Fredericksburg by forced marches, reached there on the 21st, and immediately took up a position on the hills back of the town, which he proceeded with great energy to fortify. Jackson's corps arrived from the Shenandoah Valley about November 30th, and Jackson assumed command of the right of the Confederate army, the whole Confederate line ultimately extending for more than six miles, though it was broken in several places by streams and ravines. Burnside was not ready to cross the Rappahannock until December 11th, and on that day and the 12th the Right and Left Grand Divisions succeeded in passing to the other side, though the former, which crossed directly in front of Fredericksburg, met with considerable opposition from Confederate sharpshooters concealed in a cluster of brick and stone houses on the opposite bank. Hooker's Centre Grand Division crossed on the morning of the 13th, and was broken up to assist the Right and Left. After much hesitation and vacillation, Burnside, bewildered and confused by a task far transcending his ability, finally decided upon a plan of battle, in accordance with which, about noon on the 13th, Franklin, facing Jackson at the weakest point of the Confederate line—their extreme right—ordered Meade forward, with a single division, supported by two other divisions under Gibbon and Doubleday, to seize one of the opposing heights. Meade succeeded in penetrating the Confederate line, but along with Gibbon was soon forced back; so that this movement, which was the only one made by the Federal left, resulted in nothing but loss. Meanwhile, on the Federal right, Sumner six times attacked the almost impregnable Confederate works on Marye's Hill, but was each time driven back with terrific loss, the Federal troops, however, displaying in each attack wonderful steadiness and gallantry. The hill itself was heavily fortified. At its base, and parallel to the line of battle, ran a sunken road protected by a stone wall, behind which a large force of Confederates was stationed; and the approach was such as to expose an attacking force to an irresistible rain of shot and shell. At the end of the day's fighting, the Federals had lost in killed, wounded, and missing 12,653; the Confederates, 5377. Burnside contemplated repeating his attack on the following day, but was dissuaded by his officers, and withdrew unmolested to the left bank of the river on the night of the 15th. Consult: *Official Records*, vol. xxi.; Johnson and Buel (editors), *The Battles and Leaders of the Civil War*, vol. iii. (New York, 1887); Ropes, *The Story of the Civil War*, vol. ii. (New York, 1898); Palfrey, *The Antietam and Fredericksburg* (New York, 1882); Nicolay and Hay, *Abraham Lincoln: A History*, vol. vi. (New York, 1890); Allan, *The Army of Northern Virginia in 1862* (Boston, 1892); and Henderson, *Campaign of Fredericksburg, November-December, 1862* (London, 1886).

FREDERICQ, frâ′de-rêk, Paul (1850—). A Flemish historian, born at Ghent. He was educated at Liège, and was appointed to the chair of history at Arlon, Liège, and Ghent, where he became a prominent leader of the national movement for the extension of the Flemish language, customs, and laws. His numerous works, which are distinguished by scholarly research and clearness of exposition, include: *De Nederlanden onder Keizer Karel*, vol. i. (1885); *Verzameling van stukken betreffende de pauselijke en bisschoppelijke Inquisitie in de Nederlanden* (1889-96); and *Onze historische volksliederen van voor de zestiende eeuw* (1894).

FRED′ERICTON. A city and port of entry, the capital of York County and of New Brunswick, Canada, on the Saint John River, 60 miles north-northwest of Saint John (Map: New Brunswick, C 4). The river is navigable for large vessels to this point, 84 miles from its mouth in the Bay of Fundy; small steamers go 65 to 75 miles farther up. The city is the terminus of the Fredericton and the New Brunswick railroads. There is some manufacturing, but lumbering and trading are principally carried on. The city, built on a low point of land nearly surrounded by hills, is well laid out, and has elegant public buildings, among which are the residence of the Lieutenant-Governor, Parliament buildings, Government House, Legislative Library, exhibition building, hospital, custom-house, the New Brunswick University, the provincial normal school, a collegiate and other schools. Fredericton is the seat of an Anglican bishopric, and the cathedral is a handsome edifice. The United States has a consular agent here. Founded about 1740, the village was first called Saint Anne. After New Brunswick became a British possession, Sir Guy Carleton, the Governor, in 1785, laid out the principal streets to run parallel with the river, changed the name to Fredericton, and two years later it became the capital of the province. It was incorporated in 1849. Population, in 1891, 6502; in 1901, 7117.

FREDERIKSBERG, frâᴅ′ĕr-ĭks-bĕrɢ. A western suburban municipality of Copenhagen, Denmark (q.v.), with which it is connected by the wide Frederiksberg Allee, lined with pleasure gardens. It is a handsome residential place, with several attractive features in the beautiful park of Söndermarken, a zoölogical garden, the Ny-Carlsberg Glyptothek, an art museum, and the Frederiksberg Palace, constructed in Italian style, now used as a military college. The palace was built by Frederick IV., in the first half of the eighteenth century, and stands in a prominent hill park commanding a fine and extensive view. Population, in 1900, 76,237.

FREDERIKSBORG, frâᴅ′ĕr-ĭks-bôrɢ. A Danish castle, situated on a lake of the same name, on the island of Zealand, 22 miles north-northwest of Copenhagen. It was built in 1606-20, by Christian IV. of Denmark, on the site of an older building of Frederick II. It is in the Renaissance style, and since a fire in 1859 has been restored as a national historical museum, with handsome rooms, notably the knights' hall and the dining-hall. Its church was formerly the coronation place, and contains a king's oratory, with Passion paintings by Bloch.

FREDERIKSHALD, frâᴅ′ĕr-ĭks-häld. A fortified seaport of Norway, beautifully situated on the Idefjord, at the mouth of the Tistedalselw, about 85 miles south-southeast of Christiania (Map: Norway, D 7). It has a Latin school. It exports a considerable amount of woodenware. The harbor is good, and is guarded by the fortress of Fredriksten, now of no importance, but never taken by an enemy, Charles XII. having fallen in an attempt to capture it in 1718. The town withstood a two years' siege by the Swedes, 1658-60. Population, in 1891, 11,217; in 1900, 11,936.

FREDERIKSHAVN, frå'dĕr-ĭks-hä'v'n. A seaport town of Denmark, situated on the Cattegat, 52 miles northeast of Aalborg (Map: Denmark, D 1). It has an excellent harbor, free from ice throughout the year. The chief imports are coal, iron, and cotton goods, while the exports consist of dairy products, beef, pork, and fish. Regular steamship lines run to the cities of Sweden, to England, and to Copenhagen. It is one of the youngest of Danish towns, having received municipal rights in 1818. Population, in 1901, 6478.

FREDERIKSTAD, frå'dĕr-ĭk-städ. A seaport of Norway, situated at the mouth of the Glommen, 58 miles southeast of Christiania (Map: Norway, D 7). It is an important centre for the lumber trade with Germany, Holland, and France, the wood being rafted down the Glommen. It was founded in 1570, and was for a long time strongly fortified. Population, in 1891, 12,451; in 1900, 14,573.

FRED'MAN, The. A name sometimes used by the Swedish poet Karl Mikael Bellman (q.v.).

FREDO'NIA. A city and the county-seat of Wilson County, Kan., 91 miles east by south of Wichita; on Fall River, and on the Missouri Pacific, the Atchison, Topeka and Santa Fé, and the Saint Louis and San Francisco railroads (Map: Kansas, G 4). It is the centre of an agricultural and stock-raising district, and has a supply of natural gas. Its industrial establishments include flour-mills, brick-works, linseed-oil mill, etc. Population, in 1890, 1515; in 1900, 1650.

FREDONIA. A village in Chautauqua County, N. Y., 45 miles southwest of Buffalo; on the Dunkirk, Allegheny Valley and Pittsburg Railroad (Map: New York, A 3). It is the seat of a State normal school, and has the D. R. Barker Free Library. There is a fine village square, with two handsome fountains. At Central Park, midway between Fredonia and Dunkirk, the county fair is held. The village is in the Lake Erie grape region, and has extensive nurseries, canning establishments, and patent-medicine factories. The water-works and electric-light plant are owned and operated by the municipality. One of the oldest villages in western New York, Fredonia was settled in 1803 and incorporated in 1829. Natural gas was utilized for lighting the village as early as 1821. Population, in 1890, 3399; in 1900, 4127.

FREDRO, frā'drô, Alexander, Count (1793-1878). A Polish playwright, born at Surochow, Galicia. For several years he served in the army, and at the end of that time (1814) he visited Paris and there studied the French theatre. Upon his return to Poland he produced eighteen comedies, which were played with success. He is praised for his depiction of comic types, and for the entirely national spirit of his work. His plays were collected and published in 1877, and again in 1880.—His son, Johann Alexander (1829-91), born in Lemberg, was also a dramatic author. His plays had some success; but he was far from equaling his father. His works were published in 1881.

FREE BENCH (*francus bancus*). An ancient form of dower, existing by custom, and not by common law, in certain manors in England. The right of free bench was independent of endowment, and was a purely customary provision for the wife, who became entitled to it at once upon her husband's death, without waiting, as is still the case with ordinary dower, for its assignment by the heir. Coke says: "This right is called *francus bancus*, to distinguish it from other dowers, for that it cometh freely, without any act of the husband's or assignment of the heir" (Co. Litt. 94, b). The custom varied in different manors, the widow being entitled to the whole of her husband's lands in some, while in others she received one-half or one-third only. The right applied only to estates of inheritance held by the tenure of free and common socage, and was usually, if not always, limited to the period of widowhood and the good behavior of the wife (*dum sola et casta vixerit*). See Dower.

FREE CHURCH OF ENGLAND. See Reformed Episcopal Church.

FREE CHURCH OF SCOTLAND. See Presbyterian Church.

FREE CITIES (Ger. *Freistädte*). The name given to the three German cities of Hamburg, Bremen, and Lübeck, which are sovereign States and members of the German Empire. Since the middle of the fourteenth century the term 'free cities' has been used for certain German towns, but not always with the same meaning. The designation was applied: (1) To cities in the Rhine Valley (Cologne, Mainz, Worms, Speier, Strassburg, Basel) and elsewhere which had been under the control of bishops, but had become almost independent in the course of the thirteenth and fourteenth centuries. They enjoyed even greater freedom than the so-called 'Imperial' cities. All of these cities have become parts of the larger political divisions. (2) To the Hanse cities—Frankfort-on-the-Main, Hamburg, Bremen, and Lübeck. These cities were wealthy, and became centres of active popular life and of free institutions in the thirteenth, fourteenth, and fifteenth centuries. They maintained their freedom until the time of the Napoleonic wars. By the Congress of Vienna, in 1815, they were restored to their former rights as free cities. Hamburg, Lübeck, and Bremen still retain their privileges under the reconstituted German Empire; but Frankfort was annexed to Prussia in 1866. Consult: Arnold, *Verfassungsgeschichte der deutschen Freistädte* (Gotha, 1854); Hüllmann, *Städtewesen des Mittelalters* (Bonn, 1826-29).

FREE CONGREGATIONS (Ger. *freie Gemeinden*). An association of German rationalists. It originated in Saxony, in 1841, where the members were called 'Protestant Friends' and 'Friends of Light.' The immediate occasion was an attempt to discipline a Magdeburg preacher who had expressed heretical views. Early leaders in the movement were Leberecht Uhlich (q.v.) and Gustav Adolf Wislicenus (q.v.), both of whom were forced out of the Evangelical Church for expressing liberal views. In like manner, independent congregations arose in a number of places, and in 1847 a union was effected between them on the basis of a simple profession of faith in God. By this time their gatherings, held symbolically in the open air, had come to number more than two thousand, including delegates from England and America. In 1850 they were united with the German Catholics (q.v.), and in the same year and the years immediately following some forty congregations were established in the United States, but had a short existence. After the revolutionary movements of the middle of the century several of the German governments undertook to suppress them, partly for political reasons. Many congregations were broken up. Those still in existence in 1859, about fifty in number, under Uhlich's leadership, formed a 'Union of Free Congregations in Germany,' upon a highly rationalistic basis. Inasmuch as the fullest individual liberty is allowed, the belief of members and congregations varies greatly. There has been a tendency toward radical free thought and some even deny the existence of a personal deity. The association is strongest in Berlin, Breslau, and Magdeburg. Its numbers and influence have gradually diminished. Consult: Uhlich, *Handbüchlein der freien Religion* (Magdeburg, 1859); Kampe, *Geschichte der religiösen Bewegung der neuern Zeit* (Leipzig, 1852-60); *Freidenker-Almanach* (Gotha, annually).

FREEDEN, frā'den, WILHELM IHNO ADOLF VON (1822-94). A German mathematician and expert on navigation, born at Norden, Hanover, and educated at Bonn and Göttingen. He was director of the school of navigation at Elsfleth, Oldenburg, and later became established at Hamburg, where, in 1867, he founded the German Naval Observatory, which he conducted until 1875. The purpose of this institution is to promote and to facilitate maritime intercourse. It comprises the department of maritime meteorology; a bureau of nautical, meteorological, and magnetic instruments; the department of coast meteorology and signal service; and a bureau for testing chronometers. Freeden, who was a member of the Reichstag from 1871 to 1876, founded, with H. Tecklenborg-Bremen, the publication entitled *Hansa, Zeitschrift fur Seewesen*, which he edited until 1891.

FREEDMEN'S BUREAU. A 'Bureau of Refugees, Freedmen, and Abandoned Lands,' established in the War Department of the United States by the statute of March 3, 1865. This act provided that the bureau was to be maintained through the war and for one year thereafter, and that it should have "the supervision and management of all abandoned lands, and the control of all subjects relating to refugees and freedmen," under "such rules and regulations as may be presented by the head of the bureau and approved by the President." Especially important was the provision authorizing the President to appropriate for the use of freedmen the confiscated and abandoned lands within the Southern States, not more than 40 acres for a period not longer than three years being assigned to each man thus aided. Provisions, fuel, and clothing were, moreover, to be distributed free of charge by the bureau to destitute freedmen and loyal refugees. The administration of the bureau was placed in the hands of a chief commissioner and his deputies, and in the actual application of the statute much was done with reference to labor, clothing, fuel, provisions, and schools for the beneficiaries of the plan. A second Freedmen's Bureau bill was passed by Congress, February 6, 1866, but was vetoed by President Johnson and was not passed over his veto. Later, however, there was passed over the President's veto the act of July 16, 1866, which extended for two years the term of the bureau's statutory life, increased its powers, authorized the sale for educational purposes of Confederate public property, and gave to the bureau military jurisdiction over infringements of civil rights secured by the act. In June, 1868, another bill was passed, extending the term of the bureau for one year in unreconstructed States. The bureau's chief work ended on January 1, 1869, and its educational work was concluded a year and a half thereafter. More than $15,000,000 was spent by the bureau, and, in addition to the general relief afforded, it aided appreciably in the movement for the higher education of the freedmen which resulted in the founding of such institutions as Atlanta University, Fisk University, and Howard University, the last being named after the chief figure in this work, the commissioner of the bureau, Gen. Oliver O. Howard (q.v.). Widely differing opinions have been, and are, held with regard to the methods used and the results attained by the bureau, some writers maintaining that its work was almost wholly beneficent, others that on the whole much more harm was done than good. The text of the first Freedmen's Bureau bill may be found in 13 *Statutes at Large* (38th Congress); that of the second in 13 *Statutes at Large* (39th Congress). For an account of the bureau's work, consult General Howard's report for 1869, published among the executive documents of the House of Representatives, Forty-first Congress, second session. Also consult "The Freedmen's Bureau," in *Atlantic Monthly*, vol. lxxxvii. (Boston, 1901). See RECONSTRUCTION.

FREEDOM OF THE CITY. The custom, prevalent both in American and European cities, of conferring on a distinguished visitor the privileges connected with municipal citizenship. The names of such honorary citizens or burgesses are entered upon the register of municipal electors; but they are not entitled, when non-residents, or not engaged in business in the particular city and town, to exercise the municipal franchise or to be admitted to membership in the governing bodies. The practice of conferring the freedom of the city, which at present amounts to little more than an expression of esteem on the part of the public magistrates, may be traced back to mediæval times, when the principle of freedom of domicile was by no means universally recognized, and cities partook almost entirely of the nature of private corporations, admission into which was hampered by many restrictions. The most usual way of obtaining the privileges of citizenship at that time was by a long term of apprenticeship (seven years as a rule) to one of the recognized guilds, followed by an examination in the principles of the craft, and, where the candidate was successful, enrollment in the ranks of master workmen. In view of so cumbrous a process, the presentation of the freedom of the city by a special vote of the magistrates was, in fact, a substantial favor, and was granted only in cases where great wealth or renowned citizenship made a man a desirable accession to the list of burghers. See GUILDS.

FREE FUGUE. See FUGUE.

FREE GIFT. See BENEVOLENCE.

FREE'HOLD. A town and the county-seat of Monmouth County, N. J., 25 miles east of Trenton; on the Pennsylvania and the Central of New Jersey railroads (Map: New Jersey, D 3). It has a park in which is a fine granite monument 100 feet high, commemorating the battle of Monmouth (q.v.). The town is commercially important as a distributing centre for a farming district, and manufactures shirts and underwear, foundry and machine-shop products, rasps, bicycles, etc. Freehold was settled about 1735, when county courts first began to be held here, and for many years was known as Monmouth Court House. It was incorporated in 1869. Population, in 1890, 2932; in 1900, 2934.

FREEHOLD (Lat. *liberum tenementum*, free holding or tenement). In the classification of estates in land, any estate of inheritance or for life, held by a free tenure. It is distinguished from the copyhold (q.v.), and from the leasehold (q.v.). As thus employed it is a mere term of classification, but in its origin it was coextensive in meaning with the term fee, as signifying lands held of some lord by feudal tenure. (See FEE; TENURE.) The original freehold or fee was the life estate, and the term freehold has always been employed by law writers from Littleton down in a special and technical sense, as signifying an estate for life. But its more common use, especially in American law, is as above indicated. Under the feudal system, a free holding or freehold was such a tenement as a free vassal might properly hold. The tenure might be military or non-military, and the estate might be corporeal or incorporeal, but the holding must be for life at least, and not for a definite term of years, nor, as in the case of copyhold, at the will of the lord of whom the land was held. For a description of the various forms of freehold, see FEE SIMPLE; FEE TAIL; LIFE ESTATE. See also ESTATE; FEUDAL SYSTEM.

FREE LANCE (Ger. *freier Landsknecht*, free land-trooper, in distinction from the Swiss mountaineers, but confused with *Lanzknecht*, lance-trooper). In the later Middle Ages, and early modern times, one of the roving companies of knights and men-at-arms who wandered from State to State, selling their services to any lord who was willing to purchase their aid. They played their most prominent part in Italy, where they were known as condottieri (q.v.). See BRABANÇONNES.

FREE′LAND. A borough in Luzerne County, Pa., 40 miles south of Wilkesbarre; on the Lehigh Valley Railroad (Map: Pennsylvania, E 2). It is in a coal-mining and agricultural region, and has a foundry and machine-shops, lumber-mills, etc. Population, in 1890, 1730; in 1900, 5254.

FREE LIBRARIES. See LIBRARIES, PUBLIC.

FREE′MAN, MRS. The name assumed in jest by Sarah Jennings, wife of John Churchill, Duke of Marlborough, during her friendship and correspondence with Queen Anne. The name was adopted shortly after the beginning of the acquaintance in 1683. Queen Anne adopted that of Mrs. Morley.

FREEMAN, ALICE ELVIRA. See PALMER, MRS. ALICE FREEMAN.

FREEMAN, EDWARD AUGUSTUS (1823-92). An English historian, man of letters, and lecturer. He was born at Mitchley Abbey, Harborne, Staffordshire, August 2, 1823, and at an early age was left an orphan. Under the care of his paternal grandmother he received education in various private schools, and after a course of private tuition, received a scholarship at Trinity College, Oxford, in 1841. In 1845 he graduated, and the same year was elected fellow of his college. In 1847 he married Miss Eleanor Gutch, daughter of his former private tutor. The following year with an accession to his private fortune he retired to Dursley, Gloucestershire, and applied himself to a life of historical study, research, and literature. With a special predilection for ecclesiastical architecture, in 1849 he published *A History of Architecture.* He contributed articles and reviews to *The Guardian, The Saturday Review,* and other periodicals, and also published pamphlets, all noted for their scholarship, accuracy, and correction of popular errors, which kept his name prominently before the reading public. In 1857 and 1858 he was appointed examiner in the School of Law and Modern History at Oxford, a position he again held in 1863, 1864, and in 1873. In 1860 he had removed to Somerleaze, near Wells, Somerset, where for some years he acted as county magistrate, and with political aspirations as a Gladstonian Liberal, in 1868 unsuccessfully stood as member of Parliament for Mid-Somerset. In 1863 appeared the first volume of his *History of Federal Government from the Foundation of the Achaian League to the Disruption of the United States* (a work that he left unfinished); in 1867 was published the first volume of his *History of the Norman Conquest* (6 vols., 1867-79), which established his position among English historians. He was created D.C.L. of Oxford in 1870; in 1874 received the honorary degree of LL.D. from Cambridge; and in 1880 was elected honorary fellow of his college at Oxford. For the better elucidation of his subjects he traveled extensively, visiting the places connected with the histories he was writing. In the winter of 1881-82 he visited the United States on a lecturing tour, which resulted in the publication of *Introduction to American Institutional History* (1882), *Lectures to American Audiences* (1882), and *Some Impressions of the United States* (1883). He succeeded Bishop Stubbs of Chester as regius professor of modern history at Oxford in 1884, and the same year was created honorary LL.D. of Edinburgh University. From 1886 to 1890, failing health impelled him to spend the winters of each year in Sicily, where he wrote his *History of Sicily* (4 vols., 1891-94). While traveling in Spain he died of smallpox at Alicante, March 16, 1892. Freeman was the leader of the Teutonic School of English history, and a voluminous writer. His principal work, *The History of the Norman Conquest*, in impartial, exhaustive treatment, and unimpeachable accuracy, is one of the greatest monuments of historical research, but prolixity and didacticism mar its otherwise lucid and vigorous style. It is as a political historian that he is best known. Among his writings not already mentioned are: *History and Conquest of the Saracens* (1856); *Comparative Politics* (1873-96); *Growth of the English Constitution* (1876); *The Ottoman Power in Europe* (1877); *Historical Geography of Europe* (1881); *English Towns and Districts* (1883); and *The Reign of William Rufus* (2 vols., 1882). Consult Stephen, *Life and Letters* *of Edward Augustus Freeman* (2 vols., London, 1895).

FREEMAN, James (1759-1835). An American Unitarian clergyman. He was born in Charlestown, Mass., graduated at Harvard, and in 1782 became a reader in King's Chapel, Boston. Subsequently he became a Unitarian, and induced the people of his Church to alter their prayer-book in accordance with his views. In 1787 he was ordained by his own congregation, since the Bishop refused to ordain him, and remained rector of King's Chapel (now the Stone Chapel) thirty-nine years. He was a scholarly and philanthropic man, and was one of the founders of the Massachusetts Historical Society. His was the first Unitarian church in this country. A volume of his *Sermons and Charges* was published in 1832.

FREEMAN, James Edward (1808-84). An American painter. He was born in Nova Scotia, removed with his parents to the State of New York, and became a student in the National Academy of Design. He was made academician in 1833, and after 1836 lived in Rome. His pictures are genre works and portraits. Noteworthy among his paintings are: "The Mother and Child" (1868); "Lucchese Peasants on the Sands of the Sezchio" (1883); "The Beggars"; and "Young Italy." His works are carefully finished and well colored.

FREEMAN, Nathaniel (1741-1827). An American physician and jurist, born at Dennis (Barnstable County), Mass. He settled at Sandwich (also in Barnstable County) in 1763. He studied both medicine and law, was active as a soldier during the Revolutionary period, commanded a militia regiment in the Rhode Island expedition, and from 1781 to 1791 was brigadier-general of militia. From 1795 to 1799 he was a member of Congress. He was also in the State Legislature of Massachusetts, and long a judge of probate and of the Court of Common Pleas. His reputation as a medical practitioner and as an orator was considerable. He published a *Charge to the Grand Jury at Barnstable* (1802).

FREEMAN, Susanna. See Centlivre, Susanna.

FREEMAN AND FREEDMAN. In the most general acceptance of these terms, the first implies one who has inherited the full privileges and immunities of citizenship; the second, one who has been delivered from the restraints of bondage, but who, usually, is not placed in a position of full social or even political equality with him who was born free. With the Romans the equivalent for freeman (*liber homo*) comprehended all classes of those who were not slaves; but the distinction was preserved by the application of the term *ingenuus* to him who was born free, and of *libertinus* to him who, being born in servitude, was emancipated. As the organization of Roman society survived the convulsions of the Middle Ages to a far greater extent in the towns than in the rural districts, where the institutions of feudality almost entirely superseded it, it is in the borough and other municipal corporations of Continental Europe that *freemen* still were found comprising persons inheriting or acquiring by adoption, purchase, or apprenticeship the rights of citizenship. The idea of a freeman was by no means peculiar to the Roman or Romanized population of Europe; on the contrary, it belonged to the constitution of society in all the Indo-Germanic nations. Among those branches of them commonly known as Teutonic, it was generally based on the possession of some portion of the soil. Thus in Anglo-Saxon England "the freeman was strictly the freeholder, and the exercise of his full rights as a free member of the community to which he belonged became inseparable from the possession of his holding in it." Consult Green, *The Making of England* (London, 1882). See Anglo-Saxons; Citizen; Slavery.

FRE'MANTLE, William Henry (1831—). An English clergyman. He was educated at Balliol College, Oxford; was fellow of All Souls from 1854 to 1864; was ordained in 1855; was selected preacher at Oxford in 1879-80, and Bampton lecturer in 1883. From 1883 to 1894 he was fellow and tutor in theology at Balliol. He was Canon of Canterbury in 1882-95, and appointed Dean of Ripon in the latter year. His works include: *The Ecclesiastical Judgments of the Privy Council* (1865, with G. C. Brodrick); *The Gospel of the Secular Life* (1882); and *Church Reform* (1887).

FREEMASONRY. A modern name of popular usage designating the principles of the Order of Freemasons. Formerly the word *Masonry* alone was employed, and is still used in the writings, history, and ritual of the craft. The term Freemasonry seems to have arisen from the fact that only *free* men were eligible to the Order, and that they were required to be elected with practical unanimity. The members then denoted themselves 'Free and Accepted Masons'; but the public curtailed this to Freemasons, and the order to Freemasonry. See Masons, Free.

FREE METHODISTS. See Methodism.

FREE PORT (Ital. *porto franco*). A harbor where the ships of all nations may enter on paying a moderate and uniform toll, and load and unload. Free ports form depots where goods are stored at first without paying duty; these goods may then be either reshipped for export on paying a mere transit-duty, or they may pay the usual full customs of the country, and be admitted for home consumption. Free ports thus facilitate transit trade, and form, as it were, a foreign district within a State. See Warehousing System.

FREE'PORT. A city and the county-seat of Stephenson County, Ill., 114 miles west by north of Chicago; on the Pecatonica River, and on the Chicago and Northwestern, the Illinois Central, and the Chicago, Milwaukee and Saint Paul railroads (Map: Illinois, C 1). It has a public library. There are railroad shops, and manufactures of organs, wagons, buggies, bicycles, windmills, novelties, and coffee-mills. Freeport was settled in 1835 and chartered in 1885. The government is administered by a mayor, elected every two years, and a unicameral council. Population, in 1890, 10,189; in 1900, 13,258. Here in 1858 occurred the debate between Lincoln and Douglas in which Douglas enunciated his famous 'Freeport heresy' or 'doctrine,' which was to the effect that, in spite of the Dred Scott case (q.v.), any Territory might virtually exclude the slave system by passing 'unfriendly' police laws incompatible with its existence. This doctrine alienated many of Douglas's former supporters, and greatly weakened him in the Presidential campaign of 1860.

FREEPORT, Sir Andrew. One of the members of the fictitious 'Spectator Club,' in Addison's *Spectator.*

FREER, Paul Caspar (1862—). An American chemist, born in Chicago, Ill. He graduated at Rush Medical College in 1882, and studied in Germany, taking his Ph.D. degree at the University of Munich in 1887. In 1889 he became professor of general chemistry at the University of Michigan. Besides contributions to scientific publications, he is the author of *A General Inorganic Descriptive Chemistry* (1896).

FREE SCHOOLS. See Common Schools.

FREE SHIP. See Neutrality; Declaration of Paris.

FREE′SIA. A genus of bulbous plants of the natural order Iridaceæ, natives of the Cape of Good Hope, which during the closing quarter of the nineteenth century became widely popular as greenhouse and window-garden plants for winter blooming. The leaves are long and grass-like; the long scape, bent at an angle, bears at the top five or six pale-yellowish or white erect tubular flowers of exquisite fragrance. Perhaps the freesia is the easiest and most satisfactory bulbous plant to grow, since it requires even less attention as to soil and watering than the hyacinth, and unless kept too dry, or watered too heavily, will produce flowers without forcing in from six to eight weeks. The principal producing centres of freesias are the Channel Islands, California, and Bermuda, where the finest bulbs are said to grow. For illustration, see Colored Plate of Iris.

FREE-SOIL PARTY, The. The name of a political party in the United States, which was formed in 1848, and became merged in the Republican Party in 1856. The activity of the Abolitionists (q.v.) throughout the decade of the thirties, the energetic though indirect championing of the equal rights of all men by conservative leaders, such as John Quincy Adams, and the controversy over the extension of slavery in connection with the admission of Texas, brought the question of the further extension or the restriction of slavery once more into the foreground in 1844, although both of the existing parties, Democrats and Whigs, virtually refused to recognize the existence of any such question. Within the Northern wing of each party there arose, therefore, groups of workers, such as that led by S. P. Chase in Ohio, who aimed to commit their party to the principle of opposition to the further extension of slavery in the national Territories. The issue was forced by the introduction, in the House of Representatives, of the so-called 'Wilmot Proviso' (q.v.) in 1846 by David Wilmot, a Democratic member from Pennsylvania, as an amendment to a bill in Congress making an appropriation to negotiate peace with Mexico. The proviso passed the House, but failed in the Senate. Particularly in Massachusetts was a vigorous effort made to make the Whig Party a free-soil party, and the bitter contest between the 'Conscience' Whigs and the 'Cotton' Whigs enforced upon the former the fact that for them there was no place within their old party, and that in order to establish their principle, they must found a party whose dominant purpose should be opposition to slavery extension. The necessity for this was still further emphasized by the refusal of both national conventions of 1848 to indorse the principle of the Wilmot Proviso; and so in August of 1848 there met at Buffalo the first national convention which stood for this principle, and which comprised in its membership the 'Barnburner' Democrats of New York, who had bolted their national convention, members of the former Liberty Party (q.v.) under the leadership of Chase, and the 'Conscience' Whigs of Massachusetts, led by Charles Francis Adams and Charles Sumner. By this convention Van Buren and Adams were named as the national ticket, and resolutions were adopted which concluded: "That we inscribe on our banner 'Free Soil, Free Speech, Free Labor, and Free Men,' and under it will fight on and fight ever, until a triumphant victory shall reward our exertions." Although the ticket received no electoral vote, and only 291,263 popular votes (sufficient to turn the scale in favor of Zachary Taylor as against Lewis Cass), the party secured such local advantages that it was able to send Chase to the Senate in 1849, and Sumner in 1851. On the other hand, the alliance with the 'Barnburners' was only temporary, and in the election of 1852 the Free-Soil candidate, John P. Hale of New Hampshire, received only 156,149 votes. In that year many Northerners were reconciled to their original parties by the 'finality' planks, and by the hope of thus preventing any further discussion of slavery extension. When this hope was proved to be ill-founded, by the Kansas-Nebraska struggle, old party lines were broken, and the principles of the Free-Soil Party were in large part adopted by the newly formed Republican Party. See Liberty Party; Republican Party.

FREE SONS OF ISRAEL, Independent Order of. A Jewish fraternal and benevolent society, with headquarters in New York City, founded on January 10, 1849. It has three grand lodges and 103 subordinate lodges, distributed throughout the United States, and had in 1902 a total membership of some 11,000. At the same time it had a reserve fund of over $860,000, and had since its organization paid to widows and other beneficiaries $3,300,000, and by lodges for benefits $3,150,000.

FREESTONE. A stone that is easily quarried and shaped. Sandstones and limestones possess these qualities in the highest degree, being found in stratified beds which are usually divided into blocks of convenient size by horizontal and vertical planes. When fresh from the quarries they are generally soft and can be sawn or chiseled without difficulty. The Berea sandstone and Bedford limestone are good examples of freestone.

FREETHINKER. One who forms his theological or religious beliefs by the exercise of his own reason, instead of accepting them on authority. The term came into common use early in the eighteenth century, after the publication of Anthony Collins's *Discourse of Freethinking, occasioned by the Rise and Growth of a Sect called Freethinkers* (London, 1713), and was applied particularly to the English Deists. (See Deism.) It has been used to designate rationalists, infidels, or skeptics.

FREE′TOWN. The capital of the British West African colony of Sierra Leone, situated on the left bank of the Sierra Leone River, about five miles from the coast and 33 miles by rail from Songotown (Map: Africa, C 4). It lies in a low marshy spot and is separated from the interior by a mountain chain. It is the headquarters of the British forces in West Africa, and a second-class Imperial coaling station, and has a fine harbor protected by several batteries of heavy modern ordnance. There are a cathedral, a Governor's palace, a Supreme Court, and a mission house. There is a considerable export trade in india-rubber, palm oil, gums, nuts, and hides; gold and silver ornaments, and filigree work, are skillfully made by native experts. Population, in 1901, 30,033, including only about 200 Europeans.

FREE TRADE. As first used in English literature, the term 'free trade' designated trade open to all merchants, as distinguished from that monopolized by chartered trading companies. In course of time restrictions other than monopolies attracted attention, and the term was extended to cover trade unhampered by any sort of governmental regulation. It was even used by some writers in a sense practically synonymous with 'free competition.' During the eighteenth century customs duties became the favorite mode of trade restriction, and 'free trade' became trade carried on in defiance of customs regulations. The free-traders of this period were the class we now call smugglers. At present 'free trade' designates trade that is either entirely unrestricted or restricted only in ways that afford no protection (q.v.) to home industries. The former exists only in the imagination of economists, as no government has ever attempted to put it in practice. The latter, on the other hand, is actually realized in the policy of the United Kingdom. It is to it, rather than to absolutely free trade, that the present article refers.

Although advocates of freedom of trade were not lacking in Europe before the eighteenth century (e.g. De la Croix, in France, in 1623, and Nicholas Barbon, in England, in 1696), it was not until then that any considerable number of persons of influence declared themselves for such a policy. The honor of having led in the crusade against the restrictions of the mercantile system (q.v.), which was begun about 1750, belongs to the group of French writers called Physiocrats (q.v.). By them free trade was for the first time presented as an essential principle of a well-rounded system of economics. Moreover, it was through a Physiocrat (Gournay) that currency was given to the since famous phrase, "*Laissez-faire, laissez-passer*" (Let people do as they please; let goods pass freely); and through another (Turgot, the Finance Minister of Louis XVI. in 1774) that an effort was made to put in practice the leading doctrine of the school by establishing free trade in grain throughout France.

At the same time that the Physiocrats were formulating their doctrine in France (1752-63), Adam Smith was proving to his students at the University of Glasgow that the restrictions on trade, which were universal in Europe at this period, were obstacles rather than aids to a country's industrial progress, and that freedom of trade was the policy best adapted to promote the general interest. Subsequently, while sojourning in Paris, Adam Smith made the acquaintance of some of the leaders of the Physiocratic school, and was doubtless confirmed in his opinions by what he learned of their views.

The distinguishing merit of his famous *Wealth of Nations*, regarded as a contribution to the literature of free trade, was that it showed exhaustively the evil results due to each kind of trade restriction advocated by the Mercantilists. To this part of his task Adam Smith devoted six of the nine chapters of his fourth book, and his treatment of 'protective import duties,' of 'drawbacks,' of 'bounties,' of 'treaties of commerce,' and of 'colonial restrictions' was so convincing that it did even more than the positive arguments in favor of free trade, contained in other parts of his work, to discredit the policy of trade restriction, which in 1776 still commanded the support of nearly all classes. But changes were at work, even as Adam Smith wrote, which were destined to convert many of the very merchants and manufacturers of whom Adam Smith despaired to the doctrine which he advocated.

The first prominent statesman to show the influence of Adam Smith's teaching was William Pitt, the younger. To him is ascribed the clause in the Act of Union with Ireland (1800) providing for complete freedom of trade between the two countries after 1820. Although this provision was not carried out, free-trade opinion had made such progress by the latter year that the merchants of London, headed by Thomas Tooke, presented a petition to Parliament in favor of revising the tariff in the direction of freer trade. An important factor in bringing about this result was the corn-law controversy carried on between the well-known economists Malthus and Ricardo in 1814-15, and the publication in 1817 of the latter's *Principles of Political Economy*. Ricardo put the theoretical argument in favor of free trade in a clearer and more convincing form than had Adam Smith. Furthermore, he enjoyed the advantage of being known as a practical and very successful man of business, rather than as a mere closet philosopher.

Official recognition of the growing influence of free-trade sentiment was accorded in 1823 by the appointment of William Huskisson to the presidency of the Board of Trade. Through his initiation Parliament passed several important statutes from 1823 to 1828 mitigating the severity of the navigation acts, reducing the number of dutiable articles, and scaling down the rates on those which continued to be taxed. The reform of Parliament in 1832, and of the Poor Law in 1834, diverted attention temporarily from the tariff question; but a crop failure in 1836 again brought the corn duties prominently to the front. Early in 1837 an Anti-Corn Law Association was formed in London by men prominent in public life. The following year a similar association was organized in Manchester, and in 1839 these associations, and others which had been formed in different parts of England, were fused into the National Anti-Corn Law League. From that year until 1846, when the repeal of the corn laws was definitely entered upon, agitation for free trade was carried on continuously, and with ever-increasing enthusiasm and confidence. The leaders in the movement were Richard Cobden and John Bright, representatives of the manufacturing interests of Manchester. It was this circumstance which gave rise to the custom, still common in Germany, of applying the designation 'Manchester School' to the English advocates of free trade, who are credited with more extreme *laissez-faire* views of government than even Cobden and Bright really entertained. See BRIGHT, JOHN; COBDEN, RICHARD; CORN LAWS.

In truth, there was good ground for opposition to the policy of protection as practiced by England prior to 1846, quite aside from the general question of the advantages of free trade. The most galling of the protective duties were on the food materials which entered into the every-day consumption of the English laborer. Under the English land system the high prices for agricultural products which resulted from the grain duties redounded almost entirely to the benefit of the land-holding aristocracy. The laboring masses had to pay more for bread than was paid in neighboring countries, in order that the land-holding class might enjoy high rents. Meantime manufacturers had to pay wages adjusted to the high cost of living, and see themselves outstripped in foreign markets by the rival manufacturers of other countries who bore no such burden. It was hard to make such a policy seem either wise or just in a country which was coming to depend more and more for its prosperity upon the success of its manufacturing industries. In fact, the system was doomed from the time that the Reform Act of 1832 gave representation in Parliament to the manufacturing towns of the north, and the country needed only a clear demonstration of the way in which the grain duties actually worked to induce it to demand their abolition. This demonstration was given in 1845, when the potato famine in Ireland cut off one important article of diet, and the grain duties were seen to stand like a dead wall between the starving masses of Great Britain and the abundant food supplies to be had from the Continent. At this crisis Sir Robert Peel, who had long acknowledged free trade to be the goal toward which the policies of all countries should be directed, refused to stand out longer against the demands for repeal. He was unable to carry his colleagues in the Ministry with him, but was soon recalled to form a new Cabinet, under which, after a long fight, the obnoxious duties were reduced and their ultimate abolition was brought about by the act of Parliament of June 26, 1846. The present policy of complete non-protection was introduced in 1869.

The following table indicates the progress in the reduction and simplification of the British tariff made from 1787 to 1876:

YEAR	Principal articles dutiable	Minor articles dutiable	Total articles dutiable
1787	290	1135	1425
1826	432	848	1280
1841	564	488	1052
1849	233	282	515
1855	153	261	414
1861	19	123	142
1876	10	32	42

In November, 1902, there were twelve distinct articles on the dutiable list—viz. cocoa, coffee, chicory, dried fruit, molasses, sugar, tea, tobacco, wine, beer, glucose, and spirits.

The present policy of England realizes the free-trade ideal of imposing no duties that can tend to protect or encourage home industries by means of the following expedients:

(1) Most of the dutiable goods (e.g. coffee, tea, cocoa, wine, etc.) are such as cannot, for climatic reasons, be profitably produced in England.

(2) The duties on tobacco, a commodity which might be produced in England, are rendered non-protective by the simple prohibition of such production in the United Kingdom. This policy dates from the reign of Charles II., and has become so familiar as to involve little or no hardship.

(3) The duties on goods like beer, spirits, etc., which are produced in England, are exactly offset by internal-revenue duties which place the home producer in the same position, so far as taxation is concerned, as the foreign producer. The practice of storing such goods, whether produced at home or imported, in bonded warehouses, makes the administration of this policy easy. The only exceptions to the general principle that no favor shall be shown to home as distinct from foreign producers are in connection with ship subsidies for the benefit of the merchant marine, and certain slaughter-house regulations which put foreign producers of live stock at a disadvantage. The former is defended as a necessary feature of the postal system, and the latter on sanitary grounds.

Extended attention has been given in this article to the free-trade policy of England, because that nation is the only important one to follow such a system. Its example is followed by British India, Hong Kong, and the Straits Settlements. On the Continent of Europe, Holland and Belgium have tariffs that are only slightly protective. All other European countries, and all other countries outside of Europe, however, are committed to the policy of protection. It is thus not far from the truth to characterize free trade as the British policy, in distinction from protection, which is the policy of the rest of the world.

In presenting the arguments in favor of freedom of trade, we will begin with the advantages claimed for this policy, and conclude with the disadvantages attributed to the opposite policy, protection.

As Adam Smith long ago pointed out, a principal cause of the industrial progress of the world is the division of labor and the specialization and organization which accompany it. Many men, each working at a special task and sharing his products with his fellows, can produce vastly more in a given time than the same number, each trying to produce for himself all the things that he requires. But one condition of the division of labor is opportunity to exchange one's special products for the needed products of others. *Free exchange* thus gives the widest extension to the division of labor. Obstacles to free exchange prevent the would-be specialist from giving all of his time to the occupation for which he is best fitted, because they prevent him from disposing of his products advantageously, and compel him to produce a variety of things for himself, or else go without them. When such obstacles are natural—as barriers to the transportation of goods from one mountain valley to another—the situation is unfortunate, but perhaps irremediable. When they are artificial—as are the *octroi* duties which prevent the free exchange of the products of town and country in certain European countries—they should be condemned. But the same reasons that make a free exchange of goods within a country advantageous make freedom of trade desirable. Political boundaries do not alter the essential nature of exchanges, nor the benefits that accrue to society from having them as free as possible. Foreign trade, like domestic trade, is at bottom an exchange of goods for goods, in which less-desired commodities are given for more-desired commodities, to the mutual advantage of both parties to the transaction. As different individuals are unequally fitted to carry on different pursuits, and gain an advantage by an arrangement which allows each to follow his bent, so different countries are unequally adapted for different industries. Freedom of trade, which permits the capital and labor of each country to find employment in those industries for which it is best fitted, serves to increase the aggregate output of goods in the same way that free exchange does in the case of individuals. From it there results a 'territorial division of labor,' by which each part of the world is devoted to those industries for which nature has adapted it, and through which the aggregate productiveness of the world's labor and capital is immensely increased. The chief purpose of foreign trade is to enable the world to benefit from this territorial division of labor—to permit, for example, a country like Brazil to produce coffee, not merely for its own inhabitants, but for the world; a country like Cuba to produce sugar; a country like Italy to produce olives, fruits, and silk; a country like the United States to produce corn, wheat, and the important metals. The greater the freedom of trade between countries, the greater the inducement which is held out to each to use its labor and capital in the ways calculated to contribute most to the world's wealth.

In spite of the above advantages of freedom of trade, modern countries persist in maintaining their protective systems. Advocates of free trade condemn protective duties on several grounds. Their tendency, it is urged, is to divert labor and capital from unprotected industries, where they must otherwise find investment, to the protected industry. But this must mean curtailed production. If it was desirable to invest in the protected industry, business men would have done so without any encouragement. That they needed encouragement is proof positive that the favored industry can only be carried on at a national loss. The protective duty cannot cause labor and capital to spring up out of the ground. All it can do is to influence the use to which the available supplies of labor and capital are put. These supplies set a limit to the amount of industry that can be carried on. If diverted from industries not needing protection to those requiring it, the available labor and capital must produce less in the aggregate. The policy involves, therefore, a national sacrifice. Unless good reasons for such a sacrifice are advanced, protection must stand condemned. Of course protectionists have reasons for their policy which they consider good, but to advocates of free trade they seem inadequate.

Other arguments against a protectionist policy, and therefore in favor of free trade, are beginning to be urged in the United States. First, protection is condemned on political grounds. Its tendency is to rear up a group of favored industries. Business men interested in these industries have a special inducement to watch tariff measures which others in the community lack. They are too apt, under these circumstances, to become lobbyists and corruptionists. Through them representatives, charged with shaping the tariff policy, are subjected to influences from which legislators ought to be exempt. Secondly, protection is accused of being in practice a policy of change. To be effective protective duties must adapt themselves to changing industrial conditions. But changes are always disturbing to business, and at times disastrous. Free trade, by making no discrimination between the home and the foreign producer, does not subject business to arbitrary fluctuations. Third, protection is criticised on financial grounds. Since the purpose of a protective tariff is not primarily revenue, the income which it affords to the Government bears no regular nor constant relation to the latter's financial needs. At times it may burden the public treasury with an awkward surplus, which encourages reckless extravagance on the part of the legislature. At others it may fail to bring in even that necessary minimum without which the business of Government must be seriously interfered with. Finally, certain protective duties are attacked as responsible for the trusts (q.v.). The argument is that without protection the branches of production concerned would have been open to world-wide competition, and that no merely national trust would have served to secure the monopoly powers after which the trusts are supposed to hunger. If protection has created trusts, and trusts are undesirable, protective duties ought to be reduced, it is urged, until the offending trusts feel the wholesome restraints of foreign competition. The conclusiveness of these arguments against protection can be determined only by weighing them against the counter-arguments in favor of that policy, for which see the article on PROTECTION, and references there given.

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FREE WILL. The power of choosing without external compulsion. In theology the question of free will is the question as to the nature of the will and of its action in making choices. Considered as a purely psychological question, it is as neutral as the question as to the nature and action of the affections, or of the process of syllogistic reasoning. But it is in the will that personality is viewed as centring; and since responsibility for action is ascribed to every person, it is in the will that this responsibility is conceived to reside. Choice is also the essential element of every right and every wrong action; and hence sin, its nature, origin, and guilt, are connected with the will and illustrated by it. Hence it would seem that a correct theory of the will is essential to correct views upon all these great subjects.

The main question may be comprehensively stated thus: The action of the will is always performed in the presence of motives. These are the objects presented for possible choice, with the reasons outside of the individual who is to make the choice for and against them, and the further reasons arising from his own inner condition and history. Is the act of choice an effect, depending in some way upon these motives, or is it an exercise of the power of primal causality residing in the man? Theories maintaining the first of these alternatives may all be classed under the general title of 'deterministic'; and the others will then be called 'indeterministic.'

I. The chief deterministic theories are the following:

(1) The theory that motives are causes operating upon the will, and that a volition is as strictly a caused event as the explosion of a pile of gunpowder. The forms of stating this theory will differ according as the philosophy of the theorist is materialistic or spiritualistic. If the former, as is the case with Herbert Spencer, the causation will be viewed as of exactly the same nature as all other causation. There is ultimately but one force in the universe and but one mode of operation, however different the individual forms may ultimately appear. Or if the latter, as was true of Edwards, the causation will be viewed as different because of the difference of the two terms connected in cases of physical and of volitional causation, not because of 'the nature of the connection.' For this theory, in all its various forms, there is ultimately but one argument, the inconceivability of an uncaused event. Edwards has no other argument. Even his famous *reductio ad absurdum*, by which he sought to confound his adversaries, is at bottom nothing else, for 'determining' an act of the will, he says, must be by another act of the will, if it is a case of 'self-determination,' which is as much as to say that, somehow, the will must be caused in every act.

No doubt the element in this theory which has made it attractive to so large a school of theologians (Calvinists quite generally have accepted it) is its ready applicability to the doctrines of the divine foreknowledge (q.v.) and government. If God foreknows all His own acts, He foreknows all the motives that will surround the first moral acts of men, and hence foreknows what those acts will be; and therefore He knows the whole series of motives that ever will operate upon men, and consequently all their volitions and all their acts. Thus also He governs men. The motives that act upon men are all, ultimately, brought to bear upon them by God, for they are all either the direct result of His own divine acts or the indirect result of the same. Since these motives govern men's volitions, God absolutely governs them. The great theological objection against this theory also arises from the same considerations. True activity, responsibility, and virtue or vice, are thus removed from the creature and placed in God. The man choosing is nothing but a link in the chain of causes and effects, and has no more true agency than a billiard-ball in front of a cue. If there can be said to be such a thing as sin at all, God is its author, because the only real agent in the whole universe. Edwards repelled these objections by saying that the moral character of an act lay in its nature and not in its origin. He drew a line at the moment of volition. All that goes before volition, surrounding it with incentive and eliciting it, is of God. The act and what necessarily follows it are man's.

(2) The next theory is substantially the same as the preceding, except that it does not introduce the element of ontological explanation of the uniformity of the will's action under uniform conditions. It simply affirms that the same antecedents are invariably followed by the same consequents. Hence the action of the will can be accurately predicted by any one possessed of competent knowledge of the circumstances, and hence the reign of law in human affairs is perfectly provided for. In this form the theory was propounded by John Stuart Mill, and is essentially the theory of Kant, who taught that the 'category' of causation applied simply to phenomena. Both these writers stripped causation, as applied to the world of sensation, of all power. The great argument for Mill's theory is the fact of law in human affairs. Given a rise in the value of breadstuffs, there will be a diminution in the number of marriages and an increase in the number of suicides. In any long series of years the fluctuations in the prices and in the social events mentioned will follow each other in a perfect parallelism. Law in the phenomena of society is a fact. But the theory is objected to as not being a theory at all, but only a register of facts, and again as not conforming to the facts it professes to register. Certainly it can never be proved that any combination of antecedents ever exactly recurs, or that any consequent is precisely the same as any other.

(3) Closely allied to these views is a theory recently set forth, and quite in accord with a certain drift in modern thought, of which Prof. John Dewey may be taken as the representative. It is the theory of 'logical determinateness.' The theories already reviewed and most others are said to have been concerned about a 'self-made' question, beside the point, altogether impertinent and superfluous. They have set up a dualism between the actor and his deed which does not exist. We are to go to psychology for the actual process of choice, and in that process we shall see the truth. A child sees a bright object, let us say the flame of a candle. The infant's impulse is to seize this bright object. But when it does this the object reacts upon the child, a new impulse is aroused, and so by a process of 'mediation of impulses' there comes out a distinct line of conduct. It is a tentative process, a trying in fact or imagination of this or that to adjust it to other impulses. It is all a process of choice, for it is all activity, and activity is the will. Hence freedom is easily defined. It is such activity. "Impulse is self; the developing ideal is self; the reaction of the ideal as measuring and controlling impulse is self. The entire voluntary process is one of self-expression, of coming to consciousness of self.

This intimate and thorough-going selfness of the deed constitutes freedom." The great argument for this theory is its claim to correct psychological analysis. The objections to it are that it does not provide for any self except the bundle of concrete phenomena; that it does not correctly analyze the volitional action of the mature mind; and that it does not rise at all to the consideration of deliberate choice, such as is formed at the great moments of decisive human action. From a theological point of view, whatever objections would apply to the theory of Mill would apply to this.

II. The theory of indeterminism may be stated as simply this: That the soul possesses the power of choice between proffered alternatives; that, however it may act when it does not deliberately exercise its ultimate powers, when it does, it acts as a first cause, originating the choice and determining it not by any other act, but in and by the act of choice itself. Otherwise expressed, if the motives before the will on any two occasions were exactly the same—the word motive being understood to include all things, objective and subjective, capable of influencing the will in the choice—the choices might be different. The theory does not deny the influence of motives, the custom of the will to follow habitual lines of choice, the rationality of man and his tendency to choose what in his best judgment is most for his advantage, and the determinate effect upon the will of external conditions. It maintains that in cases of automatism the action of the will is mechanical; but it is not discussing such action. In cases of rational action it teaches that the will follows the preponderating motive not by causation arising from that motive, but by free self-causation. It may compress its statement into the form that in every case of deliberate action, supposed by the agent himself to be free, the will chooses the object, and is not chosen and controlled by the object.

The arguments for this position are all resolvable into one, that such is the testimony of consciousness. By consciousness is meant not feeling, sentiment, received opinion, but the knowledge which the mind by its own native powers has of its own action whenever it acts. When it thinks, it knows that it thinks, and knows what thinking is, discriminating it from all other activity, never mixing it with feeling. So, when the mind chooses, it knows that it is choosing, not thinking, not feeling, and it knows what it is that it does in choosing. It knows that it exercises original power, and acts as a first cause.

The theory is further supported by the ease with which it is made harmonious with the primary ethical ideas. Freedom, on the deterministic theory, can be nothing more than Jonathan Edwards allows—liberty to act as we have chosen; but I do not feel free unless I have the power of sovereign choice. If I am a link in a series of causes and effects, I have no more real responsibility than the billiard-ball has for its course. But if I do whatever I do because I have myself, apart from all compulsion, physical or spiritual, deliberately chosen, then my act is truly mine, and I am responsible for its nature and its consequences.

The great objection to this theory is that primal causality in man is inconceivable. Granting that it is conceivable in God (which some determinists have denied), it cannot be conceived in a dependent creature like man. The advocate of indeterminism does not feel called upon to show its conceivability in the sense of showing how it has come about that man is a first cause, but contents himself with exhibiting the fact, upon the basis of the declarations of consciousness. The objection that the theory teaches that there are uncaused events is answered by saying that the volition is caused by the man, or that it is an example of the operation of original causality, and thus not uncaused. The great theological objection to this theory is its alleged failure to provide for the foreknowledge and government of God. It does certainly provide for most of the foreknowledge of God, for men's actions are very largely upon the basis of general reasonableness, even under this theory, and are hence largely predictable to fallible men, and much more so to an infinite God. God knows His own acts from all eternity, and must equally well know their consequences, among which will be the great majority of the acts of His free creatures. Some indeterminists have declared that the number of acts thus not foreknown would be infinitesimal, and so negligible. Others have given a larger play to the element of uncertainty, but have said that God foreknows all the possibilities of action, and thus is infinitely prepared for any action of men in any case. The gross exaggeration of Edwards, that indeterminism threw the whole universe into utter confusion, needs no refutation. If there were confusion it would not be important. The advantage of this theory as to the divine government is that it emphasizes the fact that the government of God over the actions of men is a truly moral government, one by persuasives and not by forces. If motives are virtual causes, there is no difference between the government of men and that of the planets.

Consult: Edwards, *Freedom of the Will* (London, 1754); Spencer, *Psychology* (New York, 1869); Mill, *Logic* (London, 1856), and id., *An Examination of Sir William Hamilton's Philosophy* (London, 1878); Dewey, *Study of Ethics* (Ann Arbor, 1894); Martineau, *Study of Religion* (Oxford, 1888); James, *Principles of Psychology* (New York, 1890), and id., *Will to Believe* (London, 1897); Howison, *Limits of Evolution* (New York, 1901); Ward, *Essays on Philosophy of Theism* (London, 1884); Gutberlet, *Die Willensfreiheit und ihre Gegner* (Fulda, 1893); Schlotten, *De vrije wil* (Leyden, 1859; Ger. trans. Berlin, 1874); Luthardt, *Die Lehre des freien Willens* (Leipzig, 1863); Piat, *La liberté* (Paris, 1894-95).

FREE-WILL BAPTISTS, or **FREE BAPTISTS.** See BAPTISTS.

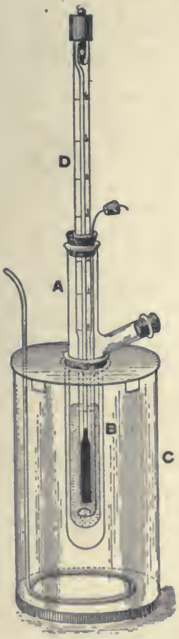
FREEZING-MIXTURES. Mixtures of substances used to produce low temperatures. The frigorific effect of such mixtures generally depends upon the following facts: (1) Melting, or the passage of a substance from the solid state to the liquid, involves the conversion of *sensible heat* into 'latent heat,' and if no heat is added to a melting substance from without, part of the sensible heat of the substance itself disappears, and therefore the temperature falls; (2) the solution of many salts in water causes the absorption of heat, and hence, again, if there is little or no addition of heat from the surroundings, there is caused a fall of temperature. The efficiency of the first of these causes may be seen from the following: If a piece of ice having the temperature of 0° C. (32° F.) is placed in its own weight of water at 79° C. (174.2° F.), it is found that after the ice has melted, the temperature of the liquid is reduced to 0° C. (32° F.), much of the sensible heat which the water contained having thus disappeared during the melting of the ice. The lowering of temperature by solution is illustrated in a striking manner by the fact that ammonium sulphocyanide, if thrown into its own weight of nearly boiling water, will reduce the temperature to the point of freezing; if thrown into its own weight of water of ordinary temperature, the same salt will reduce the temperature to —21° C. (—5.8° F.). In the mixture of pounded ice and salt used in making ice-cream, the lowering of the temperature is due both to the conversion of sensible into latent heat during the melting of the ice, and to the absorption of heat during the solution of the salt. The following table shows the more important freezing-mixtures and the temperatures that may be obtained by the use of them. Supposing that there is no absorption of heat from the surroundings, the fall of temperature produced by mixing a given set of substances is determined by the amount of sensible heat absorbed (i.e. the heat of fusion and solution) and by the specific heats of the substances between the initial and final temperatures. The temperatures obtained depend, of course, upon the initial temperatures of the mixtures. The initial temperature of any mixture given in the following table, unless otherwise specified, is assured to be the freezing-point of pure water.

SUBSTANCES (PARTS BY WEIGHT)	Temperature attained	
	Cent.	Fahr.
100 parts of snow and 33 parts of common salt	—21°	— 5.8°
100 parts of snow and 300 parts of crystallized calcium chloride	—48.5°	—55.3°
100 parts of snow and 100 parts of dilute sulphuric acid (initial temperature, 5° C., or 41° F.)	—41°	—41.8°
100 parts of snow, 13.5 parts of potassium nitrate, and 26 parts of ammonium chloride.	—17.8°	0°
100 parts of snow, 52 parts of ammonium nitrate, and 55 parts of sodium nitrate	—25.8°	—14.4°
100 parts of snow, 9 parts of potassium nitrate, and 67 parts of ammonium sulphocyanate	—28.2°	—18.8°
100 parts of snow, 13 parts of ammonium chloride, and 37.5 parts of sodium nitrate	—30.7°	—23.3°
100 parts of snow, 32 parts of ammonium nitrate, and 59 parts of ammonium sulphocyanate	—30.6°	—23.1°
100 parts of snow, 2 parts of potassium nitrate, and 112 parts of potassium sulphocyanate	—34.1°	—29.4°
100 parts of snow, 39.5 parts of ammonium sulphocyanate, and 54.5 parts of sodium nitrate	—37.4°	—35.3°
100 parts of water, 26 parts of ammonium chloride, and 14 parts of potassium nitrate	—17.8°	0°
100 parts of water, 18 parts of ammonium chloride, and 43 parts of sodium nitrate	—22.4°	— 8.3°
100 parts of water, 55 parts of sodium nitrate, and 52 parts of ammonium nitrate	—25.8°	—14.4°
100 parts of water, 57 parts of sodium nitrate, and 57 parts of ammonium sulphocyanate	—29.8°	—21.6°
100 parts of water, 9 parts of potassium nitrate, and 67 parts of ammonium sulphocyanate	—28.2°	—18.8°
100 parts of water, 32 parts of ammonium nitrate, and 59 parts of ammonium sulphocyanate	—30.6°	—23.1°
100 parts of water, 5 parts of ammonium nitrate, and 113 parts of potassium sulphocyanate	—32.4°	—26.3°
Solidified carbon dioxide and ordinary ether	—100.0°	—148°

Substances employed as freezing-mixtures, if solid, should be finely powdered, rapidly mixed, and placed in vessels that have but little conducting power. These freezing-mixtures are only available for use on a small scale. A fact extensively utilized for the production of low temperatures on a large scale is that, like the liquefaction of solids, the evaporation of liquids, too, involves the absorption of considerable amounts of sensible heat. See EVAPORATION; REFRIGERATING MACHINERY; FREEZING-POINT.

FREEZING-POINT. The temperature at which a given substance can exist partly in the solid, partly in the liquid state. If, while the substance is partly solid and partly liquid, heat is *added* to it, some of the solid portion melts, the added sensible heat changes into 'latent heat of fusion' (see FREEZING-MIXTURES), and, as long as the solid portion lasts, the temperature remains constant. Again, the *abstraction* of heat can only be effected at the expense of the latent heat of the liquid portion, which is thereby gradually solidified; and hence, as long as the liquid portion lasts, the temperature remains constant. If heat is neither added nor abstracted, the solid and the liquid portion remain in equilibrium; i.e. neither does the solid melt, nor the liquid solidify. Now, as long as this equilibrium exists, the vapor-tensions of the solid and liquid portions must be precisely equal. If the vapor-tension, say, of the liquid were greater than that of the solid, a process of distillation would take place, the solid tending to increase at the expense of the liquid; but the excess of solid would immediately melt, so that the equilibrium might be reëstablished; meanwhile, more of the liquid would be transformed into solid by distillation, and so on *ad infinitum.* The distillation could of course be employed for the production of mechanical work; and as it would go on at the expense of the heat from the surroundings, it might be employed perpetually for the transformation of the heat, say, of the ocean into mechanical work. Any process of this kind has been conclusively proved to be impossible. (See THERMODYNAMICS.) And as the assumption that the vapor-tension of the liquid portion is not greater, but less than that of the solid portion, leads to a similar impossibility, we conclude, as stated above, that as long as the solid and liquid portions of a substance are in equilibrium, the vapor-tensions of the two portions must be equal. The freezing-point of a given substance may therefore be defined as *the temperature at which the substance has the same vapor-tension in the solid and in the liquid state.* In the case of a single chemical substance (i.e. not a mixture), that temperature may be referred to either as the freezing-point of the liquid, or as the melting-point of the solid. Thus the freezing-point of water is the same as the melting-point of ice. In the case of solutions, however, the temperature at which freezing commences is not by any means the same as that at which, if entirely solidified, the mixture would begin to melt.

FREEZING-POINT OF SOLUTIONS. An important fact to be remembered in connection with freezing solutions is that ordinarily the pure solvent alone freezes out. It will be seen further that the freezing-point of a solution is the lower the greater the amount of substance dissolved. While, therefore, the solvent alone is freezing out, the temperature must obviously fall. Hence, if we wish to speak of the freezing-point of a solution of given strength, we must necessarily refer to the temperature at which freezing just commences; for freezing changes the composition. Experience shows, however, that unless the given solution is very concentrated, and unless the amount experimented upon is very small, a moderate quantity of the solvent may be allowed to freeze out, without the result of the observation being thereby considerably impaired. In other words, under proper experimental conditions, the difficult determination of the point at which freezing just commences is unnecessary. The freezing-point of solutions is now generally determined by the use of Beckmann's apparatus shown in the accompanying figure. The outer jar, C, contains some liquid whose temperature is kept rigidly constant and a few degrees below the freezing-point of the given solution, a glass stirrer serving to keep the temperature uniform throughout the volume. The wide tube, B, contains nothing but air and serves to prevent the too rapid cooling of A. In making an observation, a known amount (say, 20 grams) of the pure solvent is introduced into the strong inner test-tube, A, through the side-tube; and when freezing has set in and the thermometer shows a constant temperature, the latter is carefully noted. In this manner the freezing-point of the pure solvent becomes exactly known. Next, a known amount of the substance to be dissolved is introduced to the solvent in A, again through the side-tube; the contents of A are caused to melt by removing A from B, and when all is dissolved A is replaced in B; again, when freezing has set in and the thermometer shows a constant temperature, the latter is carefully noted. In this manner the freezing-point of the solution too becomes exactly known, and then the difference between the freezing-point of the pure solvent and the solution of known strength can be found by a simple subtraction. A great many determinations of this nature, carried out with a great variety of substances, have led to the establishment of the following law: *The freezing-point of a solution is invariably lower than that of the pure solvent, the difference being, for the same substance, proportional to the amount, and, for different substances, not only proportional to the amounts, but also inversely proportional to the molecular weights of the substances dissolved.* A comparison of this law with the one that holds good for the lowering of the boiling-point (see BOILING-POINT) will show the perfect analogy between the two laws. Here, too, as in the case of the boiling-point, the simple law holds good only for substances whose solutions do not conduct electricity, matters being much more complicated in the case of solutions of electrolytes. (See DISSOCIATION.) In the case of solutions of non-electrolytes, determinations of the freezing-point of solutions permit of ascertaining the molecular weight of newly discovered substances; and this is the purpose for which freezing-point determinations are now mostly made. All that has to be done is to determine the freezing-points of the pure solvent and of two equally strong solutions in the same solvent: one containing the new substance, the other some substance of known molecular weight, and then the molecular weight of the given substance is found simply by the rules of proportion. The solvents most frequently employed for such determinations are glacial acetic acid, water, and benzene, acetic acid being the most useful of the three. Still, other solvents too can be and are sometimes employed. See MELTING-POINT; SOLUTION; MOLECULES—MOLECULAR WEIGHTS.



BECKMANN'S APPARATUS.

NERNST'S THEORY OF THE FREEZING-POINT. The determination of the freezing-point, as explained above, seemed to be a perfectly reliable operation, until experience had shown that considerably different results are obtained by using apparatus different in size and shape, by having different temperatures in the outer jar (C), and by varying the rate of stirring in the inner tube (A). In 1894 Nernst gave a mathematical explanation of this important phenomenon—important because of its connection with the theory of solutions and with the determination of molecular weights. The principle of Nernst's calculations is as follows: The temperature in the outer jar (C) is, as we have seen, kept a few degrees below the freezing-point of the given solution. If the latter did not freeze and were not stirred, heat would flow from it into the outer vessel until the temperature in A and in C would be the same. This flow of heat would take place, for a given form of apparatus, at a rate proportional, at any instant, to the difference of temperature, at that instant, between A and C. On the other hand, regular stirring would cause the formation of sensible heat in A at a constant rate. When the steadily diminishing rate of the outflow of heat from A to C becomes equal to this constant rate of production of heat in A, the temperature in A must evidently become constant. This constant temperature Nernst terms the 'convergence-point.' All this, however, presupposes that the liquid in A does not freeze. Suppose now that as soon as the solution has reached the convergence-point, freezing has set in; and suppose that in a given case the convergence-point is lower than the freezing-point. During freezing, the latent heat of fusion is evolved as sensible heat, and the temperature rises, tending to approach the true freezing-point of the solution. There is experimental evidence to the effect that the rate at which the temperature thus rises is, at any instant, proportional to the distance of the temperature at that instant from the true freezing-point. In other words, the nearer to the true freezing-point, the slower the freezing, and hence the slower the variation of the temperature caused by it. But 'the nearer to the true freezing-point' means 'the farther from the convergence-point'; and we have seen that the farther from the convergence-point, the more rapid the rate of variation in the direction of that point. There must therefore exist, somewhere between the true freezing-point and the convergence-point, a point at which the rates of variation upward toward the true freezing-point, and downward toward the convergence-point, are precisely equal. That point Nernst terms the 'apparent freezing-point.' And he justly maintains that, everything being taken into account, the temperature usually observed, after variation has ceased, is not the *true* freezing-point, which is, of course, dependent on nothing but the nature and strength of the given solution, but the *apparent* freezing-point, which may obviously depend on the temperature of the outer jar, on the amount of solution experimented upon, on the rate of stirring, on the specific rate of freezing or melting of the solvent, etc. The effect of stirring is so considerable that in several cases the convergence-point has been found to lie, not below, but above the true freezing-point, in spite of the somewhat low temperature in the outer jar. In such cases, too, the apparent freezing-point is, of course, somewhere between the true freezing-point and the convergence-point. The difference between the true and apparent freezing-points is, as might be readily supposed, not very great. In fact, in many cases (e.g. in the case of common salt) it may be safely neglected. In other cases, however (e.g. in the case of weak solutions of cane-sugar), it must be taken into account if results at all reliable are to be obtained. The exact way of applying the theory in practice, with a view to ascertaining the true freezing-point of solutions, may be found described in the original memoir, by Nernst and Abegg, in vol. xv. of the *Zeitschrift für physikalische Chemie* (1894). It scarcely needs to be added that at the apparent freezing-point there is really *no equilibrium* between solid and liquid; that either melting of the solid portion or freezing of the liquid portion is continually going on, according as the apparent freezing-point is above or below the true freezing-point of the solution.

'Cryohydrates.' We have seen above that generally the pure solvent alone freezes out of solutions, and that the freezing out of much of the solvent would cause a corresponding depression of the freezing-point. In other words, if freezing was allowed to go on to a large extent, the given solution would become more and more concentrated and the temperature would fall lower and lower. Finally the solution would become saturated. Further freezing would then naturally cause the precipitation of the substance dissolved; the concentration of the solution would remain constant, and hence the freezing-temperature, too, would remain constant. At one time, solutions thus having a constant freezing-point were taken to be chemical compounds of the dissolved substances with the solvent, and were therefore named 'cryohydrates.' It is now clear, however, that there is no more reason for such an assumption than there is for assuming that, in general, any saturated solution is a true chemical compound. The substance freezing out of a saturated solution is nothing but a chemical mixture of the frozen solvent and the substance originally dissolved, and, of course, the melting-temperature of this mixture, being identical with the freezing-temperature of the saturated solution, is likewise constant. It is also clear that the melting-point of the 'cryohydrate' is the lowest temperature at which a solution of a given substance in a given solvent can exist. Hence, by mixing ice with salts in the proportion in which they would form 'cryohydrates,' we can obtain freezing-mixtures having the lowest *constant* temperature that can possibly be attained with the given salts. 'Cryohydrates' are now classed with the so-called 'eutectic mixtures.' See Melting-Point.

FREGENAL DE LA SIERRA, frā′Hȧ-näl′ dȧ lȧ sē̇-âr′rȧ. A town in the Province of Badajoz, Spain, 50 miles south by east of the city of Badajoz (Map: Spain, B 3). It is situated in a fertile and picturesque valley among mountains, and is laid out with regular and spacious streets. There are plazas and some buildings of merit. The ancient castle, which was erected by the Templars to whom the town was granted in 1283, has been converted into a bull-ring, capable of seating 4000 persons. The town has a considerable trade in animals, and manufactures cloth, baize, hats, leather, flour, etc. Population, in 1900, 9582.

FREHER, frā′ĕr, Marquard (1565-1614). A German historian, born at Augsburg. He studied law at Altdorf and Bourges, was professor at Heidelberg (1596-1614), and was frequently sent as Ambassador to Poland and other countries by the Elector Frederick IV. He published several important historical works in Latin, among which the *Origines Palatinæ*, with its interesting information on Heidelberg and other early German settlements, is, perhaps, the most important. It was first printed in 1599, and has since been frequently republished.

FREIBERG, frī′bĕrK. An old and important town of Saxony, the centre and seat of the mining district and mining administration of Saxony, situated on the northern slope of the Erzgebirge, 25 miles by rail southwest of Dresden (Map: Germany, E 3). Freiberg retains portions of its fortifications and presents an ancient appearance. The Late-Gothic cathedral was constructed in 1490-1512, on the site of a Romanesque church, which was burned down in 1484. The southern portal, known as the Golden Door, is a relic from the ancient church. The sculptures on the door are considered among the finest of the plastic ornamentations of the Middle Ages. The church contains objects worthy of interest, among them the burial-vault of forty-one Protestant Saxon princes. The large organ was built by Silbermann. The old castle of Freudenstein, constructed in 1572, and now used as an arsenal, the Late-Gothic Rathaus dating from the beginning of the fifteenth century, and the sixteenth-century Kaufhaus, with its museum of antiquities, are the prominent secular buildings of the city. Among the educational institutions are a gymnasium dating from 1515, and the famous mining academy, founded in 1765, and attended by students (about 450) from all parts of the world. The school possesses extensive geological and mineralogical collections, chemical and assay laboratories, a library, and the Werner Museum.

Freiberg has large smelting-works, foundries, and other establishments connected with mining. The mines are owned by the State, and are annually visited by many mining experts and tourists. There are manufactures of gold and silver wire, machinery, leather, woolens, fertilizers, etc. The city is well provided with schools, museums, scientific associations, and hospitals. It is lighted by gas and electricity and has an electric street railway. Population, in 1890, 28,955; in 1900, 30,175, including about 1000 Roman Catholics. The town owes its origin to the discovery of silver in the vicinity in the twelfth century. It was strongly fortified, and obtained municipal privileges about the beginning of the thirteenth century. After being subject to various rulers, Freiberg fell to the Saxon Albertine line in 1485. Consult: Gerlach, *Kleine Chronik von Freiberg* (Freiberg, 1898); *Freibergs Berg- und Hüttenwesen, herausgegeben durch den Bergmännischen Verein zu Freiberg* (ib., 1893).

FREIBURG, frī'bo͞orᴋ. The attractive capital of a district of the same name in the Grand Duchy of Baden, Germany, and the former capital of Breisgau (q.v.), situated in the charming valley of the Dreisam, about 11 miles east of the Rhine and 72 miles south-southwest of Karlsruhe (Map: Germany, B 4). The environs are exceptionally beautiful, embracing a rich plain, lovely vine-clad hills, and a portion of the picturesque Black Forest. In appearance Freiburg very agreeably combines features of an ancient and a modern city. It contains numerous specimens of mediæval architecture, and there remain portions of the old fortifications. The cathedral, a rival of the Strassburg Minster, and restored since 1880, is one of the most perfect specimens of Gothic architecture in Germany. It is of red sandstone, the Romanesque transept and the side towers dating probably from the twelfth century. The choir was not completed before the beginning of the sixteenth century. The famous tower, considered the finest of its kind in Europe, with chimes and a curious clock, is 380 feet high, and has a square base, an octagonal bell-tower, and a pyramid of open stonework. The main portal is richly decorated with allegorical figures, and the beautiful interior contains numerous excellent examples of stained glass belonging to different periods, creditable monuments, and a number of masterly altar-pieces by Hans Baldung and Holbein the Younger. Other interesting ecclesiastical edifices are the Roman Catholic Church of Saint Martin, dating from the thirteenth century, with a modern tower, and the Protestant Ludwigskirche, constructed in Romanesque style in 1829-39.

The noteworthy secular buildings of Freiburg include the sixteenth-century Rathaus, adorned with frescoes; the Kaufhaus, or Merchants' Hall, with a vaulted portico and statues of German rulers on the outer walls; the Kornhalle, with a fine concert hall; the old university, a sixteenth-century Renaissance structure, now annexed to the Rathaus; the new university, formerly a convent; the municipal theatre; and the grand ducal palace. Freiburg is not only well provided with handsome promenades, but is rich in monuments and memorial fountains, the most prominent of the former being the monument erected to the Fourteenth German Army Corps in 1876, and the monument to Berthold Schwarz, the alleged inventor of gunpowder. The celebrated university of Freiburg, founded by the Archduke Albert VI. of Austria in 1457, has four faculties, about 95 professors, and an attendance of over 1400 students. There are attached to it a library of 180,000 volumes, and a number of collections and institutes. Besides the university, there are two gymnasia and two *Realschulen*, several special schools, museums, a theatre, and numerous scientific and art associations.

In its equipment as a modern town, Freiburg has electric lights, an electric street railway, fine water-supply, a sewage farm, and several hospitals and charity houses. The city is rather prominent in the industrial world. It is especially well known for its manufactures of silk thread, glass, and pearls. There are also important manufactures of buttons, paper, furniture, scientific and musical instruments, machinery, chocolate and sugar products, wine, tobacco, cigars, etc. The trade is extensive in the local manufactures, and in agricultural products, and the city is besides the chief export point for the various industries of the Black Forest district. It has been the seat of an archbishop since 1827. Among the attractions on the outskirts is the Schlossberg, with an ancient ruined fortress and pleasure grounds. Population, in 1890, 48,788; in 1900, 61,506, including about 17,000 Protestants and 1020 Hebrews.

The foundation of Freiburg about the year 1090 is attributed to Count Berthold III. of Zähringen. It became a free town in 1120, and attained considerable prosperity. With the death of the last member of the House of Zähringen, Freiburg passed in 1218 to the counts of Urach, whose interference with the rights of the burghers was followed by popular uprisings. The city finally bought its independence in 1368 for 20,000 silver marks and passed under the protection of the House of Hapsburg. During the Thirty Years' War it was taken repeatedly by the Swedes. In 1644 a bloody engagement took place here between the French and the German Catholics. Freiburg came into the possession of Baden in 1806. In 1848 Freiburg was the scene of a conflict between the insurgents and the troops of the German Confederation. In the following year the Revolutionary Government was expelled from the town by the Prussians, who remained there until 1851.

FREIBURG (Swiss city and canton). See Fʀɪʙᴏᴜʀɢ.

FREIDANK, frī'dȧŋk (Middle High German *Vridanc*). The name assigned to the author of a German thirteenth-century didactic work, entitled *Bescheidenheit*. He was probably a native of Swabia, and accompanied the crusading army of Frederick II. to the Holy Land, where he composed a portion of his poem, about 1228-29. It is a sort of anthology of adages and moral reflections containing much worldly wisdom, and was very popular throughout the Middle Ages and well into the sixteenth century. Many manuscripts still exist of the original, which was translated into modern German by Simrock (1867), Bacmeister (1875), and Pannier (1878).

FREIGHT (ME. *freyt, fraught,* Dutch *vracht,* OHG. *frēht,* from Goth. *fra,* before + *aihts,* property; probably influenced by Fr. *fret,* freight, from the same source). The hire of a ship, or part of a ship, for the transport of merchandise; also the merchandise so transported. The agreement for the service is termed a charter-party (q.v.). If a merchant freight a whole ship, but neglect to fill it, the captain is not at liberty to complete the cargo from other sources, without accounting to the merchant for any moneys received for such additional load. On the other hand, if the merchant covenant to freight a certain portion of a ship, he is bound to pay the sum agreed on for that portion, notwithstanding that his goods may fail to occupy so much space. If, in the charter-party, a day be appointed for sailing, and either the merchant fail to have his goods ready for embarkation by the time fixed, or the vessel be unprepared to start—wind and weather permitting—the agreement may be declared void by the aggrieved party, who can also recover at law for any detriment caused to his property in consequence of the delay. The use of charter-parties has been traced back as far as the reign of Henry III. This contract, which in England, and generally in the commercial language of this country, is called freight, is more commonly spoken of by the legal writers of Scotland as *affreightment* (q.v.), from the French *affrètement* (Bell, *Com.,* i., p. 414), but there is no essential difference in the laws of the two countries with regard to it. Throughout the whole commercial world, indeed, in so far as its provisions are not made the subjects of positive stipulation either by charter-party or *bill of lading* (q.v.), they will be held to be in accordance with the usage of trade, and of that particular branch of trade to which the hiring has reference. The contract for freight is generally considered to be an 'entire' contract, and not capable of part performance. It contemplates the completion of the voyage and the safe arrival of the cargo at its destination. Usually, therefore, no freight is earned in the event of a loss at sea, nor in case of a delivery at any other port than the one specified in the charter-party.

It was formerly held that the payment of the wages of the crew was contingent on the earning of freight by the ship, in accordance with the maxim of Lord Stowell, that "freight is the mother of wages." But this rule, which was already subject to many exceptions, has been abrogated in Great Britain by the Merchant Shipping Act (17 and 18 Vict., c. 104), and by statute in the United States, and wages may now be recovered either by seamen or apprentices, even though no freight has been earned by the vessel; but in cases of shipwreck the claim for wages will be barred if it be proved that the man did not exert himself to the utmost to save the ship, cargo, and stores. The provision was first introduced by 7 and 8 Vict., c. 112, sec. 17, which enacted that, in order to enable him to recover his wages, the seaman should be bound to produce a certificate from the master or chief surviving officer of the ship, to the effect that he had so exerted himself. By sec. 183 of 17 and 18 Vict., c. 104, the onus of proof is very properly laid on those who impugn the conduct of the seaman. The old rule is still adhered to in America, but it is not applied to the master, and it does not hold with reference to seamen if the freight has been lost by the fault either of the master or owner; e.g. if the ship has been seized for debt, or for having contraband goods on board.

The word freight is a term formerly applied only to maritime business, such as the hire and use of vessels, but more recently extended to goods transported on land, as on railways where there are regular 'freight' cars. The term is used to signify also the money or consideration paid for carrying. With regard to freight by ships, the laws of the United States are practically the same as in England. See CARRIER, COMMON; and TRANSPORTATION.

FREILIGRATH, frī′lĭk-rät, FERDINAND (1810-76). A German poet of almost bizarre originality, an admirable translator, and a sturdy liberal agitator, born at Detmold. His father was a teacher. Though apprenticed to a grocer at fifteen, Freiligrath continued his studies, and published verses in local journals before he was twenty. The years 1831 to 1836 he spent as banker's clerk in Amsterdam. Then, after publishing translations of Hugo's *Odes,* and *Chants du crépuscule,* and launching a literary journal, *Rheinisches Odeon* (1836-38), he became a bookkeeper at Barmen, but continued writing lyrics, of which a volume (1838) won immediate and wide favor. This contained the famous "Löwenritt," "Prinz Eugen," and "Der Blumen Rache," probably his masterpieces. He afterwards gave himself wholly to literature, coöperating in several now unimportant works, and gaining a pension of 300 thalers from the Prussian King. Gradually his associates drew him into political strife. In 1844 he surrendered his pension, and in his *Glaubensbekenntnis* placed his poetic gifts at the service of the democratic agitation that was to culminate in the Revolution of 1848. Such poems as "Trotz alledem" (a translation of Burns's "A man's a man for a' that"), "Die Freiheit," "Das Recht," and "Hamlet," made his absence from Germany expedient. He went to Belgium and Switzerland, published in 1846 *Englische Gedichte aus neuerer Zeit,* a volume of fine translations, and *Ça ira,* a collection of political songs, and lived till 1848 in England. At the invitation of Longfellow, he meditated going to America, but on the short-lived triumph of liberalism returned to Germany as a democratic leader, was for a time imprisoned, published *Zwischen den Garben* (1849) and *Neue politische und soziale Gedichte* (1850), after which he went once more into exile in England (1851), where he remained till 1868, supporting himself by office work and admirable poetic translations, among which an anthology, the *Rose, Thistle, and Shamrock* (1854), and Longfellow's *Hiawatha* (1857), with Shakespeare's *Cymbeline* and *Winter's Tale,* are worthy of record for their felicity and faithfulness. These kept up his popularity in Germany, where in 1866 a subscription of 60,000 thalers was raised for him, partly as a political manifesto. The general amnesty proclaimed in 1868 brought him back in time to celebrate the triumph of 1870 in the popular "Hurrah, Germania!" and "Die Trompete von Vionville." Freiligrath's works are collected in 8 vols. (Stuttgart, 1870-71), and those up to 1858 in 6 vols. (New York, 1858-59). There is a volume of select translations into English, edited by his daughter, Mrs. Kroeker (Leipzig, 1871). For his biography consult: Kippenberg (Leipzig, 1868); Schmidt-Weissenfels (Stuttgart, 1876); Buchner, *Ferdinand Freiligrath, Ein Dichterleben in Briefen* (Lahr, 1881-82); Richter, *Freiligrath als Uebersetzer* (Berlin, 1899); and Rodenberg, *Jugenderinnerungen* (Berlin, 1901).

FREIMUND RAIMAR, frī′mo͞ont rī′mär. A pen-name of the German poet Friedrich Rückert (q.v.).

FREIND, frīnd, John (1675-1728). An English physician. He was born at Croton in Northamptonshire, graduated at Christ Church, Oxford, in 1698, entered the medical profession, and in 1705-07 acted as physician to the English army under the Earl of Peterborough in Spain. In 1722 he was a member of Parliament, but being suspected of favoring the restoration of the Stuarts, he was incarcerated in the Tower. From 1727 until his death he was physician to Queen Caroline. He published several works on medical subjects, the most important of which is his *History of Physick from the Time of Galen to the Beginning of the Sixteenth Century, chiefly with regard to Practice* (2 vols., 1725-26). His brother, Robert (1667-1751), was a well-known classical scholar.

FREIRE, frā′ē-rȧ, Ramon (1787-1851). A Chilean soldier and legislator, a grandson of Freire de Andrada, born at Santiago, Chile. He served in the War for Independence from 1811 to 1820, and soon thereafter became the leader of the Liberal Party, which elected him Supreme Dictator of the Government in 1823, his reëlection following in 1827. In this capacity he put an end to Spanish domination in Chile in 1826, when he forced the last Spaniards to leave the island of Chiloé. Upon the accession of the Conservative Party to power he was banished to Peru. He returned in 1842, after an absence of five years, and thereupon retired from political life.

FREIRE DE ANDRADA, dȧ ȧn-drä′dȧ, Gomes (1685-1763). A Brazilian administrator, born at Coimbra, Portugal. From 1733 until shortly before his death he was Governor and Captain-General of Rio de Janeiro, and his administration finally extended also to the other provinces of Brazil. He contributed greatly to the development of the mining interests of the country and was an active promoter of colonization. The war over the boundaries of Brazil and Paraguay was fought during his administration (1754-56). As the greatest colonial governor of Brazil, his achievements have been celebrated in the epic poem entitled *Epicos Brasileiros* (2d ed. under the title *O Uraguay*, 1811), by José Basilio da Gama.

FREISCHÜTZ, frī′shụts (Ger., free shooter). A legendary hunter who enters into compact with the devil that six balls from his gun shall follow his own will, but the seventh the devil's. The idea was general in the fourteenth and fifteenth centuries and especially during the Thirty Years' War. It emerged in literature in Apel's *Gespensterbuch* (1810-15), and as adapted to Weber's opera, *Der Freischütz* (1821), is universally known.

FREISING, frī′zĭng. A town of Upper Bavaria, situated on the Isar, about 22 miles northeast of Munich (Map: Germany, D 4). It is supposed to be of Roman origin, and has an interesting Romanesque cathedral, built at the end of the twelfth century and restored at the beginning of the eighteenth, with two towers and a curious quadruple crypt. The former episcopal palace is now occupied by a clerical seminary. The historian Otto von Freising was bishop here from 1137 to 1158. There are a theological lyceum, a gymnasium, and a number of benevolent institutions. The chief manufactures are mill and other machinery, pottery, and stained glass. The town was the capital of the Bishopric of Freising, which was founded in 724 and united in 1803 to the Bishopric of Munich. Population, in 1890, 9485; in 1900, 10,092, almost exclusively Roman Catholics.

FREJES, frā′нĕs, Francisco (?-1845). A Mexican historian. He was born in Guadalajara, was educated for the priesthood, and became a Franciscan monk. He became widely known as a pulpit orator, but left the pulpit to pursue his historical studies. For this purpose he entered the Convent of Guadaloupe, in Zacatecas, and he became its superior in 1838. His most valuable work was his *Historia breve de la conquista de los estados independientes del imperio mejicano* (new ed. 1878), a work which is still one of the most valuable authorities on the subject. He also wrote *Memoria histórica de los sucesos más notables de la conquista particular de Jalisco por los Españoles* (1842).

FRÉJUS, frȧ′zhụs′ (Lat. *Forum Julii*). The Department of Var, France, situated a mile inland from the embouchure of the Argens (anc. *Argenteus*) into the Mediterranean Sea, and 15 miles southeast of Draguignan (Map: France, N 8). It was originally settled from Marseilles, and was afterwards colonized anew by Julius Cæsar, and called Forum Julii. It has numerous important Roman remains, including walls, a pharos, a circus, and a viaduct. Augustus made the harbor, which is now silted up, the most important naval station in Gaul. Among its long list of native celebrities are Agricola the general, Roscius the actor, Cornelius Gallus the poet, the Abbé Sieyès, etc. Population, in 1901, 4156.

FREKI. See Geri.

FRELINGHUYSEN, frē′lĭng-hī′zen, Frederick (1753-1804). An American lawyer and soldier. He was born in Somerset County, N. J., graduated at Princeton in 1770, studied law, and was admitted to the bar in 1774. In 1775 he was elected to the Provincial Congress of New Jersey, and at the outbreak of hostilities became a member of the Committee of Public Safety. He was elected again in the year following, and when that body resolved itself into a constitutional convention, he took an active part in drawing up the new Constitution. He was a major in the 'Minute Men' organization early in 1776, and on the dissolution of these forces recruited and became captain of one of the detachments of artillery authorized by the State Legislature, and known as the 'Eastern Artillery Company.' He participated in the battle of Trenton, and it is said to have been a shot from his pistol that mortally wounded Colonel Rahl, the Hessian commander. Early in 1777 he was made colonel of New York militia, and took part in all the military operations of Washington's army in that year, and in the battle of Monmouth, in June, 1778. In 1778-79 and again in 1782-83, he was a member of the Continental Congress. The ten years succeeding he devoted to the practice of his profession, in which he attained great eminence, and from 1793 to 1796 he was a member of the United States Senate. In 1794, during the Whisky Insurrection, he served as a major-general of the New Jersey militia, called out by President Washington.

FRELINGHUYSEN, FREDERICK THEODORE (1817-85). An American lawyer and political leader. He was born in Millstone, N. J., graduated at Rutgers College in 1836, studied law in the office of his uncle, Theodore Frelinghuysen, at Newark, and on the acceptance by the latter of the office of chancellor of the University of New York in 1839, although then only twenty-two years old, succeeded to his large practice. He rose rapidly in his profession, was city attorney of Newark in 1849, and became widely known as a counsel of many important corporations, among them the Central Railroad of New Jersey and the Morris and Essex Canal Company. He was originally a Whig in politics, but was one of the founders of the Republican Party in New Jersey. In 1861 he was a delegate from New Jersey to the Peace Congress at Washington, and in the same year became Attorney-General of the State, serving until 1866. In the latter year he was appointed by Governor Ward a United States Senator, to fill the vacancy caused by the death of William Wright. In the year following his appointment was confirmed by the Legislature, and he served out the remainder of Senator Wright's term, which expired in 1869, achieving a reputation as an able debater. In 1870 he was appointed by President Grant to succeed John Lothrop Motley as Minister to Germany, but declined the appointment after he had been confirmed by the Senate. In 1871 he was elected to the United States Senate. After the disputed election of 1876 he was one of the framers of the bill creating the Electoral Commission, and after the commission was constituted, in 1877, served as one of its members. After several years spent in the active practice of his profession, he again entered political life, this time (in December, 1881) as the successor of James G. Blaine as Secretary of State in the Cabinet of President Arthur. He died in May, 1885, scarcely two months after his retirement from office.

FRELINGHUYSEN, THEODORE (1787-1862). An American legislator and educator, the son of Gen. Frederick Frelinghuysen (q.v.). He was born at Millstone, N. J., graduated at Princeton in 1804, was admitted to the bar in 1808, raised and commanded a company of volunteers in the War of 1812, and from 1817 to 1829 was Attorney-General of New Jersey. In 1828 he was elected to the United States Senate, where he was prominent as a debater on the Whig side, taking an especially active part in the discussions over the re-chartering of the United States Bank and the withdrawing of the Government deposits therefrom, and over the tariff; but, failing of re-election in 1835, he resumed the practice of his profession in Newark, N. J., of which city he was Mayor in 1837 and 1838. He was chancellor of the University of New York from 1839 to 1850; was the Whig candidate for the Vice-Presidency on the ticket with Henry Clay in 1844; and was president of Rutgers College, in New Brunswick, N. J., from 1850 until his death. Consult Chambers, *Life of Theodore Frelinghuysen* (1863).

FRELINGHUYSEN, THEODORE JACOBUS (1691-1747). An American clergyman. He was born in West Friesland, and after holding a pastorate there, came to America and settled in New Jersey as a missionary of the Reformed Dutch Church (1720). He became widely known as an eloquent preacher and was elected a delegate to the first convention of the Dutch Reformed Church, held in New York. Several of his sermons, delivered in Dutch, were published at Utrecht, where they were most favorably received; others, translated into English by William Demarest, with a biographical sketch by him, were published in 1856.

FRE'MANTLE. The chief seaport of Western Australia, on the western coast, at the mouth of the Swan River, 12 miles southwest of Perth, with which it has daily steamer communication (Map: Australia, B 5). The United States has a resident consular agent. It has a fine modern town hall with a lofty clock-tower, a handsome Anglican church, hospital, insane asylum, and a literary institute with loan library. Extensive harbor works are in progress, there having been originally but an open roadstead. The town is divided into three districts; the population, in 1901, was: Fremantle, 14,623; Fremantle East, 2489; Fremantle North, 3247.

FRÉMIET, frā'myā', EMMANUEL (1824—). A French sculptor, born in Paris. He was the nephew and pupil of Rude. In 1843 he exhibited his "Gazelle." This was followed by a group of animal studies, of which "The Mother Cat," "A Wounded Dog," and a "Group of Dogs," were bought by the State. In 1850 his "Wounded Bear" made a great sensation. From this time he exhibited constantly, and also contributed illustrations of birds and beasts to various magazines, and did a number of paintings in the same genre. In 1875 he succeeded Barye as professor of drawing and molding at the Jardin des Plantes. His celebrated "Gorilla Carrying Off the Body of a Woman" was refused at the Salon of 1859, but afterwards he received the medal of honor (1877) for this powerful, if repulsive, piece. His works are very numerous. His figure pieces are often monumental and of great dignity. Many critics consider him superior to Barye in his animal studies; and his originality, his knowledge of anatomy, and the power and realism of all his work are unquestioned. Other statues and groups are the graceful, spirited "Faun," in the Luxembourg; "Jeanne d'Arc," his masterpiece, in the Place des Pyramides, Paris; "The Man of the Stone Age"; equestrian statues of Napoleon I., at Grenoble, the Duke of Orleans, the Prince of Condé; the colossal elephant of the Trocadéro Fountain, Paris; "A Mounted Torch-Bearer of the Fifteenth Century"; "Velasquez on Horseback," and the statue of Lesseps at Suez (1899). He was awarded the Legion of Honor in 1878.

FREMONT'. A city and the county-seat of Dodge County, Neb., 37 miles northwest of

Omaha; on the Union Pacific and a branch of the Chicago and Northwestern railroads (Map: Nebraska, H 2). It has important dairying and live-stock interests, machine-shops, flouring-mills, planing-mills, and other industrial establishments; and is the seat of the Fremont Normal School. Settled in 1857, Fremont was incorporated in 1871, and is governed under a revised charter of 1901, which provides for a mayor, chosen every two years, and a city council, one-half of whose members are elected at large and the remainder by wards. The city owns and operates its water-works and electric-light plant. Population, in 1890, 6747; in 1900, 7241.

FREMONT. A city and the county-seat of Sandusky County, Ohio, 30 miles southeast of Toledo; on the Sandusky River, and on the Lake Shore and Michigan Southern, the Lake Erie and Western, and other railroads (Map: Ohio, D 3). The city is at the head of steam navigation on the river, is the centre of a fertile agricultural region and of productive oil and natural-gas fields, and has manufactures of electro-carbons, engines and boilers, agricultural implements, shears, cutlery, underwear, beet-sugar, sash, doors, and blinds, etc. There are several public parks, and the Birchard Public Library, founded and endowed in 1873, by Sardis Birchard, uncle of ex-President Hayes. Spiegel Grove, the home of ex-President Hayes, is still occupied by his heirs. Population, in 1890, 7141; in 1900, 8439. A trading post, probably temporary, was established here in 1785, and a fort, called Fort Stephenson, was erected early in 1812. A popular rendezvous of the Indian tribes, Fremont was known as Lower Sandusky until 1850, when its present name was adopted in honor of J. C. Frémont. On August 2, 1813, Major George Groghan, with 150 men, was attacked here by General Proctor at the head of 400 English and 300 Indians. The latter were repulsed with the loss of 94 killed and wounded, while of the Americans only one man was killed and seven wounded. Consult Howe, *Historical Collections of Ohio* (3 vols., Columbus, 1889-91).

FRÉMONT, JOHN CHARLES (1813-90). A distinguished American explorer and soldier, the son of a French emigrant to America. He was born in Savannah, Ga., January 21, 1813, and was educated in Charleston College, from which he received a degree in 1836. Soon afterwards he passed the necessary examination, and was appointed professor of mathematics in the United States Navy. In 1838 he was commissioned second lieutenant in the topographical engineers. In October, 1841, he married Jessie, the second daughter of Senator Thomas H. Benton (q.v.). In 1842 a geographical survey of all the territories of the United States was proposed by him, and, although his idea was not entirely carried out, he was sent at the head of a party of twenty-eight men to explore the Rocky Mountains. In his accomplishment of this task he reached the Wind River Mountains, and ascended the highest peak, later known as Frémont's Peak —13,570 feet above sea-level. His next enterprise was the exploration of the territory between the Rocky Mountains and the Pacific Coast, a region then almost unknown. Early in 1843 he started with thirty-nine men, and after a journey of 1700 miles, came to Great Salt Lake. Thence he proceeded northward to the tributaries of the Columbia River, following the valley to Fort Vancouver. In November he started upon his return, but finding himself and party in danger of death from cold and starvation, he turned westward, and after great hardship succeeded in crossing the Sierra Nevada Mountains, and in March reached Sutter's Fort in California, not far from the place where four years later gold was discovered. He returned safely by a more southerly route, reaching Kansas in July, 1844.

In 1845 Frémont went on another exploring expedition, his last under direction of the Government, spending the summer along the continental divide, and in the winter again crossing the Sierras. He asked permission of the Mexican authorities at Monterey to continue his explorations, but they refused and ordered him to leave the country. War between Mexico and the United States was then imminent, and the authorities seemed to have been fearful of Frémont's influence upon the inhabitants of California, many of whom were Americans. Frémont, refusing to leave, fortified himself and his sixty-four men on a small mountain about thirty miles from Monterey; but when the Mexicans prepared to besiege the place, he retired and proceeded to Oregon. Near Tlamath Lake he was overtaken by a courier, Lieutenant Gillespie, who had been sent by the Government with a secret message to its agent in California, and who seems to have instructed Frémont, on behalf of the Administration, to coöperate in its plan for the peaceable acquisition of California. Over the exact nature of these instructions, however, there has been much controversy. Frémont immediately returned to California; but, instead of conciliating the native Californians and encouraging them to remain neutral in case of war with Mexico, he seems to have fomented a revolt, known as the 'Bear Flag War.' Sonoma was captured and independence decided upon; but when it became known that the United States was at war with Mexico and that Commodore Sloat had seized Monterey, the American flag supplanted the Bear flag. Frémont then coöperated with Commodore Stockton in establishing the power of the United States in California, and was by him made military commandant and civil Governor. Toward the end of this year (1846), General Kearney arrived with a force of dragoons. Both he and Stockton had orders to establish a government; and friction immediately ensued.

Frémont prepared to obey Stockton, and continued as Governor in defiance of Kearney's orders. For this he was tried by court-martial at Washington, the trial lasting from November 2, 1847, to January 31, 1848, was convicted of 'mutiny,' 'disobedience of the lawful command of a superior officer,' and 'conduct to the prejudice of good order and military discipline,' and was sentenced to dismissal from the service. President Polk approved of the conviction for disobedience, but remitted the penalty, and Frémont resigned.

In October, 1848, with a party of thirty-three, Frémont started on an independent overland journey in search of a practical route to California by way of the Rio Grande. His guide lost the trail in the Rocky Mountains, and, after untold sufferings, the surviving members of the party were obliged to retreat to the Rio Grande. From there Frémont proceeded to California by the Gila route, reaching Sacramento in the spring of 1849. He then settled in California, and from September, 1850, to March, 1851, represented the State in the United States Senate. Still faithful to the route he had attempted in 1848, in 1853 he made his fifth and last exploration, crossing the Rockies and again succeeding in reaching California. In these last two expeditions his father-in-law, Senator Benton, was interested, and the discovery of practical routes for highways or railroads was the object of the explorations.

In 1856 the Republicans nominated Frémont for the Presidency. His nomination was due to his availability, to the renown gained by his explorations, and to his known opposition to the extension of slavery. In the ensuing election he met with defeat, receiving only 114 electoral votes, while Buchanan received 174. Soon after the outbreak of the Civil War Frémont was appointed major-general, and was placed in command of the Western Department, with headquarters at Saint Louis. On August 30, 1861, he issued a proclamation confiscating the property "of all persons in the State of Missouri who shall take up arms against the United States, or who shall be directly proved to have taken an active part with their enemies in the field," and freeing all slaves of such persons. Soon afterwards he established 'a bureau of abolition' to carry out the order respecting manumission. This ill-advised action greatly embarrassed the Administration, and on September 11 President Lincoln annulled the order as unauthorized and premature. Frémont's total incapacity for the command of a department soon became evident, and, acting upon the report of Secretary of War Cameron and Adjutant-General Thomas, whom he had commissioned to make an investigation, President Lincoln removed him from command in November. A few months later, however, Frémont was placed in command of the Mountain Department of Virginia, Tennessee, and Kentucky. After the battle at Cross Keys, June 8, 1862, he declined to serve, on the ground that he outranked General Pope, who was then in command of the Army of Virginia. On May 31, 1864, he was nominated for the Presidency by a small faction of the Republican Party, constituted in great part of members of the Radical wing. Finding but a slender support, he withdrew his name in September. He subsequently became interested in the construction of railroads, and in 1873 was prosecuted by the French Government for alleged participation in the swindles connected with the proposed transcontinental railway from Norfolk to San Francisco, and was sentenced on default to fine and imprisonment. He was Governor of Arizona from 1878 to 1882, and was appointed a major-general on the retired list by act of Congress in 1890. He died July 13, 1890. Consult: Frémont, *Memoirs of My Life, Including Five Journeys of Western Exploration* (Chicago, 1887); Mrs. Frémont, *Souvenirs of My Time* (Boston, 1887); Campaign Memoirs by Bigelow (New York, 1856) and Upham (Boston, 1856).

FRÉMONT, frå'môn', JULES JOSEPH TASCHEREAU (1855—). A Canadian author, born in Quebec, appointed professor of civil law in Laval University in 1893. From 1891 to 1896 he was a member of the Dominion Parliament. His publications include *Le divorce et la séparation de corps*, and a *Compendium of the Dominion Laws of Canada.*

FRÉMY, frå'mé', EDMOND (1814-94). A French chemist, born in Versailles. He became professor of chemistry at the Polytechnic School, Paris, in 1846. In 1864 he founded, with Chevreul, a free laboratory at the Museum of Natural Sciences, of which institution he became director in 1879. His researches extended to almost every branch of chemistry. In addition to numerous treatises in the *Annales de Chimie et de Physique,* he published *Traité de chimie générale* (7 vols., 3d ed. 1862-65). The *Encyclopédie Chimique,* a work in 10 volumes, upon which he was engaged for thirteen years, was prepared by him in collaboration with several distinguished scientists, and was completed in 1894.

FRENCH, ALICE (1850—). An American novelist, better known as OCTAVE THANET. She was born at Andover, Mass., and began her literary career, about 1878, with studies of a social and economic bent, but soon turned to short stories, in which she achieved much success, especially after her removal to the West, Iowa and Arkansas, gave her opportunities for exploiting regions hitherto little attempted in fiction. Noteworthy among her stories are *The Bishop's Vagabond* (1884), *Whitsun Harp, The Regulator,* and *The Mortgage on Jeffy. Knitters in the Sun,* a collection of stories (1887), *Otto the Knight,* and other trans-Mississippi stories (1891), *A Book of True Lovers,* and *Stories of a Western Town* (1893), are volumes characteristic of her work in this field. A longer novel, *Expiation* (1890), won, and deserved, high praise for its nervous vitality, truth to life, and vivid local color. *We All* (1891) is a story for children. "Octave Thanet" has also edited *The Best Letters of Mary Wortley Montague.*

FRENCH, DANIEL CHESTER (1850—). An eminent American sculptor, born at Exeter, New Hampshire, April 20, 1850. In 1867 his father, who was a judge in the New Hampshire courts, moved with his family to Concord, Massachusetts. He studied for a year at the Massachusetts Institute of Technology, and in 1869 worked for a month in the studio of J. Q. A. Ward. In 1873 he made for the town of Concord the earliest and one of the cleverest of his more important works, the "Minute Man," and upon its completion went to Florence, where he spent a year with the American sculptor Thomas Ball. In 1876 French opened a studio in Washington; from 1878 to 1887 he made Boston and Concord his headquarters, and in the latter year settled in New York. Meanwhile, he had made frequent visits to Paris, but although he absorbed whatever appealed to him most, he does not seem to have come directly under the influence of any one French master.

French is a sculptor of great versatility, and the catalogue of his works is large. His "John Harvard" (1882) is in the severe, simple style of the "Minute Man." His busts of Emerson and Alcott are in the firm close modeling of his earlier years, and are characterized by the lofty intellectual quality which he so often shows in his portraitures. The marble statue of Lewis Cass in the Rotunda of the Capitol (1888) in Washington is more loosely handled than the two former works, but is large and strong. In the Gallaudet Monument in Washington, where the little girl is studying intently the deaf-mute language with its inventor, Gallaudet, French first introduces the element of pathos which has become so familiar in his later works. Perhaps the most interesting is his relief, "Death and the Sculptor," for the monument of Milmore, which was exhibited at the Chicago Exposition of 1893. Of the large amount of decorative sculpture which was done by French, or under his direction, at this World's Fair, the most noteworthy were the many groups of animals. The great gilded statue of the Republic, which French placed in the Court of Honor, is perhaps the most striking colossal statue of recent times. His other work includes the monument to John Boyle O'Reilly in the Back Bay Fens of Boston (1895); the statues of Starr King in San Francisco, and of Rufus Choate in Boston; and the two fine statues, "History" and "Herodotus," for the Congressional Library in Washington. With the assistance of Potter he made an equestrian statue of General Grant, in Fairmount Park, Philadelphia (1899), and one of Washington for the United States Building in the Paris Exposition (1900). Among his most recent works are: the Hunt Memorial in Central Park, New York; the bronze doors of the Boston Public Library; and a large amount of decorative work for the Minnesota State House. His Milmore Memorial received a third-class medal at the Paris Salon of 1892, and at the Exposition of 1900 he was awarded a medal of honor. He was elected a member of the Society of American Artists; of the National Sculpture Society; and associate of the National Academy of Design.

FRENCH, John Denton Pinkstone (1852—). A British soldier, born at Ripple Vale, Ripple, Kent. He served in the Royal Navy in 1866-67, entered the army in 1874, served with the Nineteenth Hussars in the Sudan campaign of 1884-85, and commanded that regiment in 1889-93. From 1893 to 1894 he was assistant adjutant-general of cavalry on the staff, and from 1895 to 1897 was assistant adjutant-general at army headquarters. He was promoted to the command of the Second Cavalry Brigade in 1897, and appointed major-general in command of the cavalry division in Natal in 1899. In 1900 he became lieutenant-general (local) commanding the cavalry division in South Africa. He directed the operations about Colesberg (November 10, 1899, to January 31, 1900); was in command of the cavalry in the operations terminating in the relief of Kimberley (February, 1900), and of the cavalry division of Lord Roberts's army in the operations leading to the capture of Bloemfontein and Pretoria. He also commanded Lord Roberts's left wing in the various battles east of Pretoria. For his services he was promoted to be major-general, and appointed to the command of the First Army Corps at Aldershot.

FRENCH, Mansfield (1810-76). An American educator. He was born at Manchester, Vt., and was educated at Burlington (Vt.) Seminary, and at the Divinity School of Kenyon College, Ohio. He was one of the founders of Marietta College, in 1835. In 1845 he joined the Methodist Episcopal Church, and from 1845 to 1848 was president of the Xenia (Ohio) Female College. He took an active part in the movement that led to the founding of Wilberforce University, the first college for negroes in America. In 1858 he became editor of *The Beauty of Holiness*, a religious paper published in New York City. He was an ardent abolitionist, and at the outbreak of the Civil War made a study of the negro question with a view to preparing for the emancipation of the slaves. With an idea that the solution of the problem was to be found in education, he laid before President Lincoln his views. In February, 1862, he organized an immense mass meeting in Cooper Union, New York City, where his plans were explained and the organization of the National Freedman's Relief Association followed. Of this association he became general agent, and proceeded to Port Royal with a large corps of teachers and assistants, where, in spite of opposition from both civil and military authorities, his work among the negroes was crowned with considerable success.

FRENCH, William Henry (1815-81). An American soldier. He was born in Baltimore, Md., graduated at West Point in 1837, was assigned as second lieutenant to the First Artillery, served in the Florida War of 1837-38, and was engaged on frontier duty until 1847. In the Mexican War he served in the Southern campaign, for part of the time as aide-de-camp to General Pierce, and was brevetted. On September 22, 1848, he was promoted to be captain, and between this time and 1861 was stationed successively at Fort Monroe, Fort McHenry, Fort Clark (Tex.), and Fort Duncan (Tex.). In September, 1861, after the outbreak of the Civil War, he was promoted to be a brigadier-general of volunteers, and, in October, to be a major in the Second Artillery. He served throughout the Peninsular campaign, earning the brevet of lieutenant-colonel; participated in the Maryland campaign, and earned the brevet of colonel; was promoted to be major-general of volunteers in November, 1862; served in the battles of Fredericksburg and Chancellorsville; and subsequently commanded the Third Army Corps in various minor engagements. On May 6, 1864, he was mustered out of the volunteer service, and on March 13, 1865, he was brevetted major-general in the Regular Army. After the close of the war he served as a member of various boards, was several times detailed for inspection duty, was promoted to be colonel in July, 1877, was in command of the troops engaged in the suppression of the Baltimore and Ohio Railroad riots, July 18-24, 1877, and on July 1, 1880, was retired from active service.

FRENCH AND INDIAN WAR. The name usually given to the struggle in America between the French and English (1754 to 1760), roughly coincident with the 'Seven Years' War' in Europe. The French, being in possession of Canada and Louisiana, reënforced their establishments on the banks of the Saint Lawrence and near the mouth of the Mississippi, and attempted, by the occupation of various points in the interior with a line of military posts and of protected trading posts, to confine the English to a strip of territory on the Atlantic coast, while they themselves planned to occupy both the land of the Ohio basin and that surrounding the Great Lakes. The territory in dispute, and especially that watered by the Ohio, was claimed by both France and England, the French resting their claims largely upon the alleged effect on the ownership of an entire river basin of a settlement at the river's mouth, and the English insisting that their King's grants of land 'from sea to sea' became literally effective and valid when the coast-line was permanently occupied. No permanent settlements had been made in the territory thus claimed by both, although a small settlement of Virginians was established on the Monongahela, and settlements in Ohio were in contemplation. The Governor of Virginia had organized a provincial force to protect the western frontier, and hostilities began in May, 1754, with an attack made by Washington on a French force under Jumonville. In 1755 an army of regulars, under General Braddock, acting with a detachment of Virginia troops, undertook an expedition for the capture of Fort Duquesne, which the French had built at the junction of the Monongahela and the Allegheny. This force was disastrously defeated, July 9, 1755, and the French retained full control of the frontier. Being enabled to operate on an 'inner line' of communication, while the English were obliged to conduct a series of isolated and unrelated campaigns, the French maintained their advantage until the summer of 1758, when they inflicted a great defeat upon the British in the battle of Ticonderoga, July 8th, their last important success. The fortune of war now turned. Largely as a result of a more energetic policy introduced by the Pitt Administration, the English campaigns were prosecuted more vigorously, and resulted in the capture of Louisburg (July, 1758), of Fort Frontenac, on Lake Ontario (August, 1758), and of Fort Duquesne (November, 1758). The French line of defense and of communication was thus broken; and this success was made secure in the following summer by the capture of Ticonderoga, Crown Point, and Fort Niagara. Finally, on September 13, 1759, the forces of General Wolfe defeated the army of Montcalm which was defending Quebec, whose surrender followed, and in September, 1760, control was gained of Montreal and the rest of Canada. Peace was not made until the Seven Years' War (q.v.) on the Continent was concluded; and in the Treaty of Paris, of 1763, France ceded Canada to England, and England received from Spain the Floridas, which she retained until 1783, while Spain received Louisiana from France. Thus France lost her possessions on the American continent. Consult: Winsor, *The Mississippi Basin* (Boston, 1895); Parkman, *Montcalm and Wolfe* (Boston, 1884); Sargent, *History of an Expedition Against Fort Duquesne, 1775*, edited from original manuscripts (Philadelphia, 1856); Casgrain, *Montcalm et Lévis* (Tours, 1898); Doughty and Parmlee, *The Siege of Quebec and the Battle of the Plains of Abraham* (6 vols., Quebec, 1901); and Bradley, *Fight with France for North America* (New York, 1902).

FRENCH BROAD. A river rising in the Blue Ridge Mountains, in western North Carolina (Map: North Carolina, B 4). It flows northwest and then west, and joining the Holston River 3 miles above Knoxville, Tenn., forms the Tennessee River (q.v.). It is over 200 miles long, and flows through a country famed for its scenery. The chief town in its course is Asheville, N. C.

FRENCH CHALK. See CRAYON.

FRENCH CON'GO. A possession of France in Western Equatorial Africa, bounded on the north by Wadai, on the east and south by Egyptian Sudan, the Congo Free State, and Angola, and on the west by the Atlantic Ocean, the Spanish colony Rio Muni, Kamerun, and Nigeria (Map: Congo, B 2). It reaches Lake Chad and the Bahr-el-Ghazal in the north. The Congo and Ubangi rivers border it on the southeast. The area is about 450,000 square miles. The coast is diversified by several bays and many lagoons. The interior is but partly explored. It is mountainous in the south, with elevations reaching 3600 feet; the river valleys are numerous, extensive, and very fertile. The Gabun, Ogowai, Sanga, Lalli, and Licona are among the important rivers, some of which may be classed as navigable streams. The fauna includes the buffalo, leopard, rhinoceros, and crocodile; and the home of the chimpanzee and gorilla is found here. The French Congo is one of the most promising of African colonies, although the climate is unhealthful for Europeans. The forests are valuable, and rubber is a prominent product. There are mineral resources of gold and iron; also some copper. Manioc is raised by the natives, and coffee, vanilla, etc., are grown by Europeans. The exports are chiefly rubber, ivory, and costly woods. Some of the other exports are coffee, cocoa, palm oil, and piassava. In 1900 the exports amounted to $1,457,000. The imports for 1900 were $2,050,000. Almost 40 per cent. of the total commerce is with France and French colonies. Ninety-nine vessels, of 137,698 tons, entered the ports in 1900, mostly at Loango, which has the only good harbor.

The country is administered by a Commissioner-General and an Administrative Council. The upper regions along the Congo and Ubangi rivers are, however, under military control, and are known as the Military Territory of the Countries and Protectorate of the Shari. The local budget of 1900 balanced at about $740,000. A loan of nearly $400.000 was authorized for the construction of roads, telegraphs, and other public improvements. In the French budget of 1902 the Congo called for $100,000. The transportation and communication facilities are very meagre. A telegraph line connects Brazzaville, Loango, and the English Atlantic cable. The population is estimated at from 8,000,000 to 15,000,000, including the Fan, Bakalai, Mpongwe, and several other important and interesting races or tribes. The capital is Libreville, with about 3000 inhabitants. Loango, Franceville, and Brazzaville are also noteworthy towns. There are 56 schools for boys and girls, and over 2500 scholars.

The coast of French Congo was discovered by the Portuguese in 1470. In 1841 the French established a footing on the Gabun River, and actively began operations. Libreville was founded in 1849. In 1862 Cape Lopez was acquired, and the French were then in possession of the coast for 200 miles. Explorations and military expeditions extended the French rule northeast until, by a series of conventions beginning in 1885 with European powers, the present limits of the French Congo were fixed. Consult: Dutreuil de Rhins, *Le Congo français* (Paris, 1885); Payeur-Didelot, *Trente mois au continent mystérieux. Gabon-Congo*, etc. (ib., 1900); Guillemot, *Notice sur le Congo français* (ib., 1900).

FRENCH CREEK. A stream in Jefferson County, N. Y., emptying into the Saint Lawrence. On November 1 and 2, 1813, a small American force, under General Brown, intrenched on its banks near the site of the present Clayton, N. Y., repelled, with the loss of only two men killed and four wounded, an attack of twelve British vessels, which suffered severely in the engagement.

FRENCH FURY, The. A name given to the attack made by the Duke of Anjou on Antwerp on January 17, 1583. The attempt was repelled, and all of the assaulting force were killed or captured.

FRENCH GUIANA. See Guiana.

FRENCH GUINEA, gĭn′ē. A French possession in West Africa, bordered by Portuguese Guinea and by Senegal on the north, the Military Territories of French Sudan on the east, Sierra Leone, Liberia, and the Ivory Coast on the south, and the Atlantic Ocean on the west (Map: Africa, C 3). French Guinea extends on the north to the towns of Kedugu and Birgo, and includes in the east the territories of Dinguiray, Siguiri, Kurrussa, Kantan, Kissidugo, and Beyla, the river Sankarani forming the eastern border. The area is about 95,000 square miles, embracing Futa-Jallon (q.v.). The coast region was known as Rivières du Sud before 1893. French Guinea is largely a mountainous country, with a rather favorable climate, and some fine forests. The coast streams are numerous. The Manea and Dubreka rivers empty into the ocean near Konakry. The country produces millet, rice, rubber, gum, and palm-kernels. In Futa-Jallon, coffee, rice, cotton, etc., are raised, and there are minerals and large herds of cattle. Several manufacturing establishments, mainly French, are situated in Konakry. In 1900 the imports of French Guinea were $2,755,200, about one-tenth being from France; the exports were $1,887,500, of which about one-fourth went to France. Cotton goods were the main import (nearly one-third); and by far the leading export was rubber, with cattle and palm-kernels ranking second and third, respectively, on the list. The commerce of the country is rapidly increasing. In 1899, 5002 vessels of 308,523 tons cleared the ports. French, English, and German steamers regularly visit Konakry, from which port a railway is building to the Niger to attract trade from Timbuktu, Sigu Sikora, and other interior points. There is a telegraph line from Konakry to Boké and thence to Kankilifa.

French Guinea is divided into administrative circles, and is administered by a Governor (who is under the Governor-General of French West Africa, q.v.), and by a local council of six members, three chosen from the Government officials, and three from the leading citizens. Futa-Jallon has, to some extent, a separate administration. The local budget of French Guinea balanced at $1,330,800 in 1901. The financial condition of the colony is good. In all the foregoing statistics Futa-Jallon is included, as well as in the population of the country, which is given at 2,200,000. The capital, Konakry, on the island of Tombo, is the chief city, and is newly built. It is connected with the mainland by a bridge. Other noteworthy towns are Boké, Ubréka, and Timbo. There were seven schools in the country in 1897.

The coast of French Guinea was known to Portuguese explorers at an early date. In the first part of the seventeenth century French merchants began trading in parts of the country, and in 1685 the Compagnie de Guinée obtained from Louis XIV. exclusive commercial privileges for a large part of the West African coast, and the region was embraced in a general way in the French 'pacte colonial.' The littoral portion, called Rivières du Sud, was taken possession of outright by France during the period from 1854 to 1869. The French, in 1884-85, obtained a footing in Bure, and forced the Almani rulers of Futa-Jallon and neighboring districts on the east to a treaty of peace in 1887. A stubborn contest was next undertaken with Samori and his newly founded kingdom of Wassulu, on the southern headstreams of the Niger, northeast of Liberia. In February, 1891, at Kantan, on the Milo, he was defeated and driven out of Bissandugu, Sanakoro, and Keruane, and his followers, the Sofa, were scattered. Consult Aspe-Fleurimont, *La Guinée française* (Paris, 1900).

FRENCH HORN. A name assigned to the horn formerly much used in the full orchestra. It has a range from $B\flat_1$ to f^2, but the four tones at either extreme are difficult and seldom used. See Horn.

FRENCH INDO-CHINA. The general name for the French possessions in Southeast Asia, to wit, the colony of Cochin-China, and the protectorates of Tongking, Laos, Annam, and Cambodia. (For more particular information, see these different headings.) French Indo-China is bounded by China on the north; the China Sea on the east and south; the Gulf of Siam on the southwest; and the Mekong River on the west, beyond which lies Siam. The estimated area and population of French Indo-China in 1900 are given as follows:

	Area in sq. miles	Population
Tongking	46,000	7,000,000
Annam	50,000	5,000,000
Laos	98,400	605,000
Cambodia	38,600	1,500,000
Cochin-China	22,000	2,270,000
	255,000	16,375,000

The French emigration to Indo-China is very small, but the Republic is actively engaged in organizing the affairs and improving the commercial and industrial conditions of the country. At the head of the French administration is the Governor-General, with his seat in Saigon, under whom are the Governor of Cochin-China and the Resident Superiors of the four protectorates. Kwang-Chi-Wan, on the China coast, is also since 1900 a political part of Indo-China, having been leased from China. Since 1887 a customs union has united these various possessions. In 1900 the imports were valued at $37,200,000, the exports at $31,200,000. The local revenues for Indo-China for 1902 were estimated, in piastres, at 27,142,000, and the expenditures at 27,128,000. The budget is maintained chiefly by receipts from Government monopolies, customs, railways, telegraphs, and posts, and provides for the military and judiciary systems, the public works, etc., of the whole country. The expenditures of the Republic (budget of 1902) for Indo-China were, approximately, $6,800,000. The Indo-China Bank is a large institution, especially engaged in furthering local enterprises. Many lines of railway are in process of construction. The army consists of 8860 French and 14,935 native troops, all under French officers.

The beginning of French influence in Southeastern Asia may be traced to missionary efforts. These were begun in the seventeenth century in Siam, whence they spread to Tongking and Annam. A Siamese embassy appeared at the Court of Louis XIV. in 1685. In 1774 local troubles broke out in Annam, and King Gya-Long was forced to seek shelter with the French bishop in the Province of Saigon. Military aid on a large scale was promised, but the troubles in France delayed operations until 1802, when, with the assistance of the French, King Gya-Long regained his throne. His dominion extended over what is now French Indo-China. Several French officers remained in his service, and French engineers fortified the chief cities. King Gya-Long gave certain privileges to French and Spanish missionaries, but his successors were less friendly. The advisers of King Minh-man, about 1820, urged him to a policy of repression which turned into persecution. A French expedition set out against China in 1857, and the gradual conquest of the whole country began. In 1861-62 the French became masters of the principal part of Cochin-China, and about the same time they established a protectorate in Cambodia. In 1882 the Third Republic resolved upon a highly aggressive policy, and after that year, and especially after the war between Japan and China had left China in a helpless condition, the French steadily pressed their conquests until they possessed all the country east of the Mekong.

FRENCH LANGUAGE. HISTORY. The ancient inhabitants of the country now called France were the Gauls or Celts. They spoke the Celtic language, which is related to the dialect of modern lower Brittany and to the Welsh of Wales. In the first century B.C. the Romans, under the leadership of Julius Cæsar, conquered Gaul and imposed the Latin language upon its inhabitants. There were, however, two Latin languages, that of the writers and orators (*sermo urbanus*) and that of the lower classes of the people (*lingua Romana rustica*). It was the latter that was brought to Gaul by the soldiers, merchants, and colonizers. Four centuries later Latin was spoken almost everywhere in that country. Every now and then a scholar, impelled by patriotic motives, endeavors to prove that the Gauls did not give up the tongue of their ancestors, but that Latin and Celtic possess in common a number of roots, and that French can therefore just as well be traced back to Celtic. The chief difficulty in this theory is that, as we know so very little of the Celtic tongue, its characteristic features can be only vaguely conjectured; thus a direct proof of the thesis is *a priori* impossible. Moreover, Italian, Spanish, and the other Romanic languages offer such convincing examples of an evolution similar to that of Latin into French that the question may safely be considered as settled. To gain an idea of the weakness of the position of the Celtic School one need only read Marcillac, *Les vraies origines de la langue française* (Paris, 1901). On the other hand, nobody ever tried to contest the fact that the Gauls bequeathed a certain number of words (exactly how many it is difficult to say) to the *lingua Romana rustica*, and through this medium to French. Here are a few examples:

LATIN	FRENCH	CELTIC
alauda,	alouette,	?
beccus,	bec,	becco, whence also becquée, becqueter, bécasse, béquille.
carrus,	char,	carr.
brugaria,	bruyère,	brug.
leuca,	lieue,	leuga.

In the fifth century Gaul was conquered a second time by the Visigoths, Burgundians, and Franks; the last of whom, the most powerful of the Germanic nations, soon became masters of the whole country. But this time the conquerors adopted the language of the conquered, introducing into it only about four hundred Germanic words, mostly terms of war, among which may be mentioned:

LATIN	FRENCH	GERMANIC
berfredus,	beffroi,	berfrit.
crapaldus,	crapaud,	craup.
faldistolium,	fauteuil,	falststuol.
filtrum,	feutre,	filz.
mariscalcus,	maréchal,	marahscalc.
werra,	guerre.	werra.

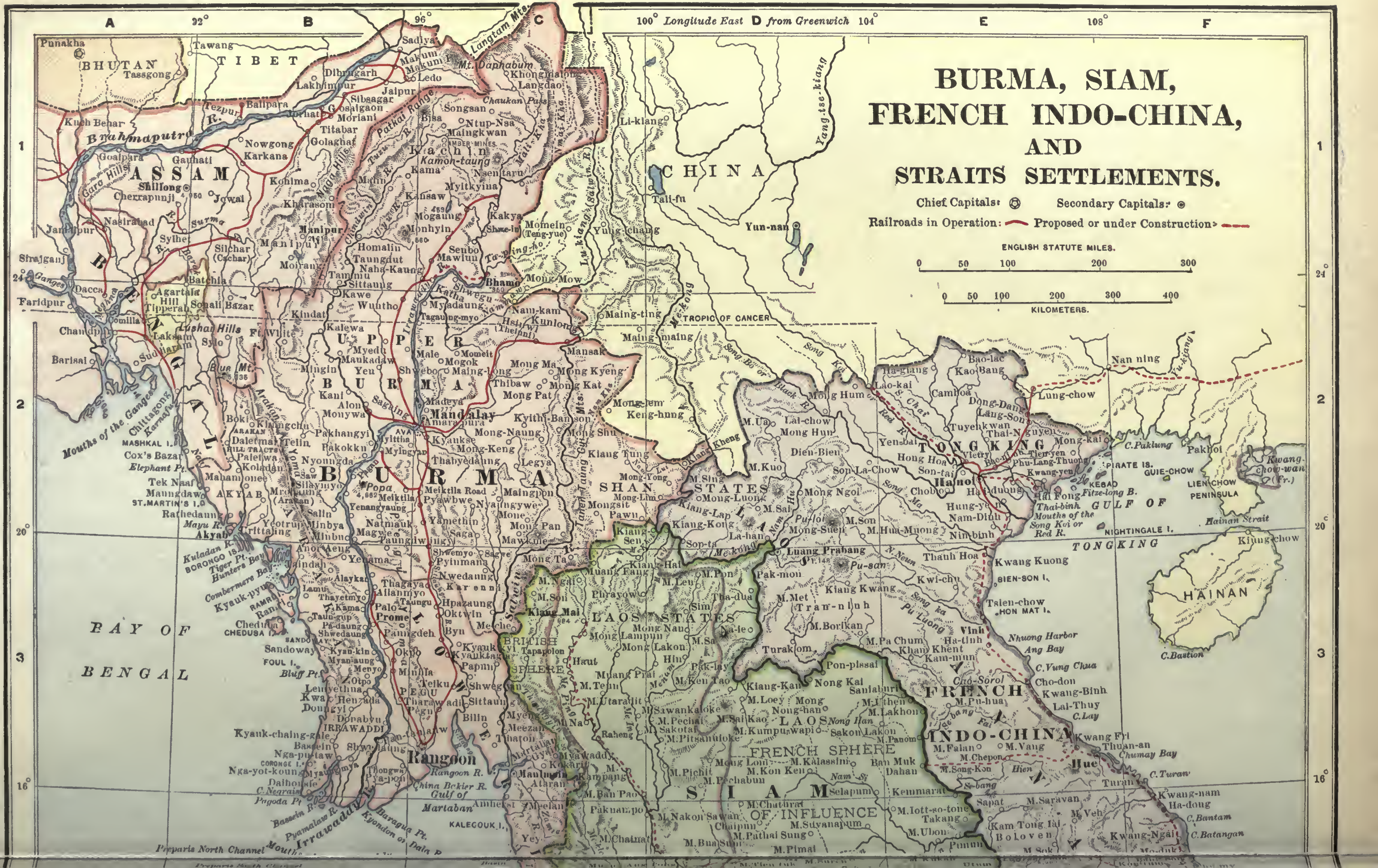
A few Greek words came into France in the sixth century through Greek colonies on the Mediterranean, especially Marseilles, Nice, and Monaco; as for instance:

LATIN	FRENCH	GREEK
bastum,	bat,	root of *βαστάζειν*.
byrsa,	bourse,	*βύρσα*.
colla,	colle,	*κόλλα*.
hemicrania,	migraine,	*ἡμικρανία*.

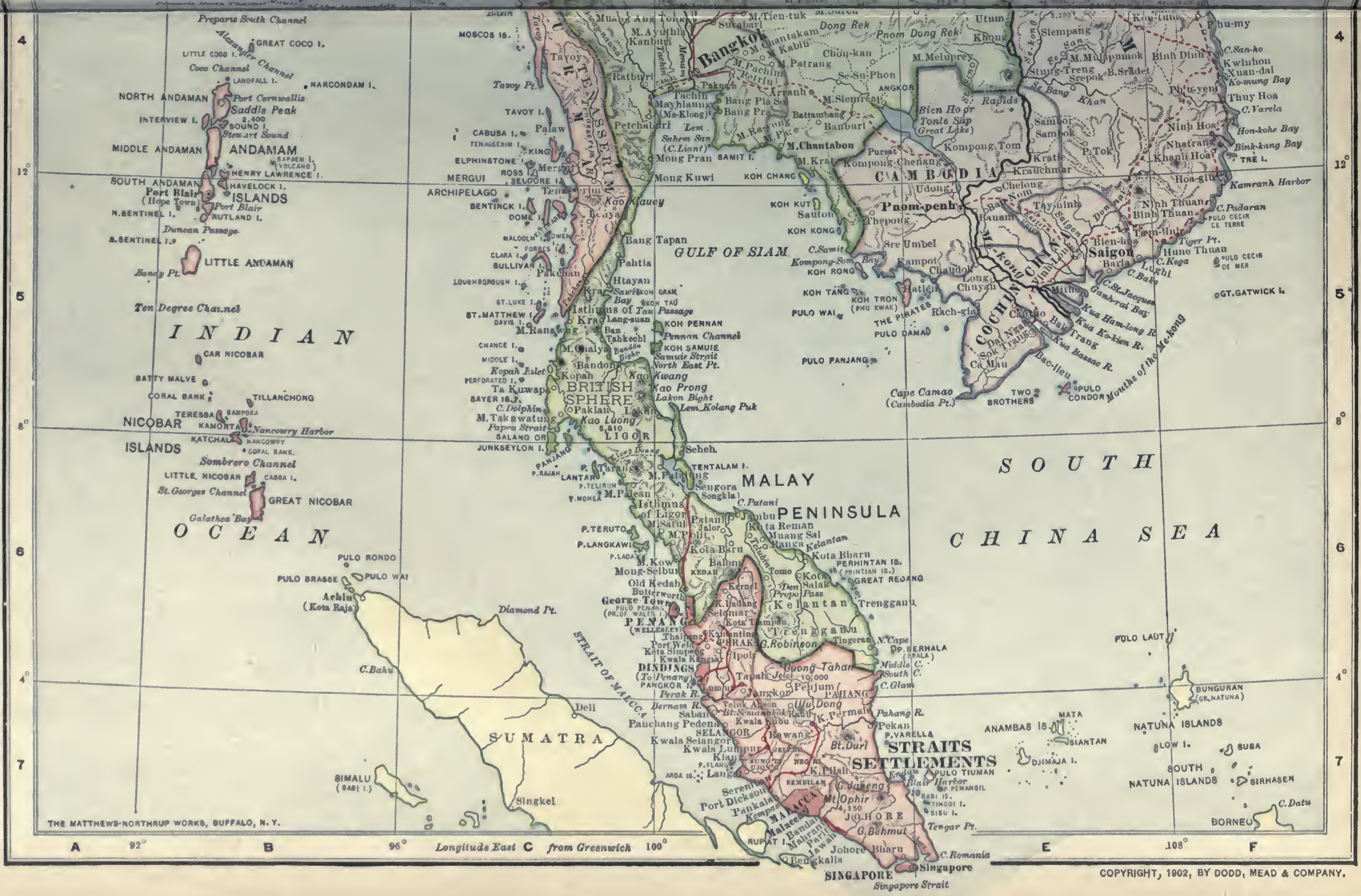
A number of other Greek vocables were introduced in subsequent periods either by the Church (*évéque, prêtre, hérétique, moine, basilique*), or by scholars for a definite scientific purpose.

Toward the beginning of the seventh century the idiom spoken in France differed enough from the lower Latin to be called a new language, the *Romanic*. The main transformations undergone by Latin were the disappearance or obscuration of the non-accented syllables in words (*hospitalem* becomes *hôtel; rigidum, roide; liberare, livrer,* etc.); and the prevalence of analysis over synthesis in syntax (*Petri* becomes *de Petro; amavi* = *amatum habeo, habet* = *ille habet*). As early as the sixth century the historian Gregory of Tours remarks that "the scholarly language [Latin] is no longer understood except by a few people, while the rustic [Romanic] is understood by everybody." From that same time the homilies of the Church councils begin to be translated into the popular idiom. The famous 'Capitulaires' (royal edicts) of Charlemagne, in the eighth century, require the bishops to use Romanic in their sermons.

Quite early a marked difference was noticeable between the spoken languages of the northern part of France and that of the south, the dividing line extending from La Rochelle, at the mouth of the Charente, through Limoges and Clermont-Ferrand, to Grenoble. The first, which was the more important of the two, and was to become the French of to-day, was the *langue d'oïl*, while the second, which became the modern Provençal, was the *langue d'oc*. *Oïl* and *oc* were the words meaning 'yes' in the two respective



BURMA, SIAM, FRENCH INDO-CHINA, AND STRAITS SETTLEMENTS.



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idioms. The two idioms again branched into several dialects or patois. Of those of the *langue d'oïl*, four were especially important: those of Ile de France, Normandy, Picardy, and Burgundy. The dialect of Ile de France began to prevail over the others in the twelfth century, thanks especially to the political predominance of the kings residing in Paris, who gradually succeeded in compelling allegiance on the part of the barons of the provinces. The ascendency was complete at the end of the fourteenth century.

The *langue d'oc* also split into different dialects (Gascon, Languedocien, Auvergnat, Provençal, Savoyard, etc.). An era of brilliant literary production seemed for a moment to assure its supremacy in the future over the *langue d'oïl*. After the twelfth century, however, it declined rapidly; but it did not fall back into the condition of a 'patois' (the name given in French to languages merely spoken, not written), without contributing a certain number of terms to the *langue d'oïl: carguer, cap, mistral, corsaire, vergue, carnassier, jaser, ruser, fâcher, rôder, malotru, badaud, forçat, ménestrel, ballade, pelouse, caisse,* etc.

During the twelfth and thirteenth centuries the French language had a great popularity in Europe, if we may trust two Italian writers of the time—Martino di Cassale and Brunetto Latini. We are even told by others that rich barons engaged the services of French-born tutors for their children. No new contribution to the vocabulary is to be mentioned at this period, except a few Arabic terms (about fifteen) brought to France by the knights who returned from the Crusades (*bazar, haras, avoine,* etc.). The fourteenth and fifteenth centuries, the epoch of the disastrous Hundred Years' War, were less brilliant. After the tenth century, when the classical Latin had fallen already into complete disuse, a tendency prevailed among more or less happily inspired scholars to introduce into the current language words taken bodily from Latin, and therefore unmodified by the natural process of transformation through the medium of lower Latin and Romanic. It happened therefore that a considerable number of Latin terms gave two French words, one of popular, the other of scholarly origin:

hospitalem,	hôtel, hôpital.
rigidum,	roide, rigide.
fragilem,	frêle, fragile.
liberare,	livrer, libérer.

These words are called *doublets*. This method of enriching the dictionary became common in the fourteenth century, and lasted through the fifteenth and the sixteenth. The Renaissance only encouraged this tendency. In the seventeenth century, however, a reaction set in, and Molière may be said to have contributed much toward putting an end to the false erudition of his contemporaries by his pitiless attacks, particularly in the amusing third 'Intermède' to the *Malade imaginaire*.

We have to record in the sixteenth century the first serious attempt to regulate the French language, to adopt grammatical rules, and to fix the vocabulary. While this was certainly a good work, one cannot but regret the loss of a great many picturesque and excellent words sacrificed to a need of order and to the fear of impropriety. Here are a few of the excluded terms: *ardoir (brûler), cuider (croire), desduit (plaisir), emmy (au milieu de), ire (colère), orée (bord), ost (armée), prou (beaucoup).* Some, like *dévaler (descendre), fêtard (parasseux)*, and others have remained in the colloquial vocabulary.

A formidable invasion of about five hundred Italian words during the sixteenth century was also detrimental to the language. It was due to the predominance of Italian customs at the Court as a result of the presence of Catharine de' Medici, and also to the wars in Italy. These two distinct influences brought in two distinct classes of words; the one consists of expressions borrowed from the sphere of art: *ariette, aquarelle, arcade, arlequin, artisan, baladin, balcon, barcarolle, bouffon, burlesque, buste, campanile, carnaval, charlatan, concert, esquisse, façade, feston, fugue, girandole, gouache, mandoline, opéra,* etc. The other is composed of military terms: *alarme, alerte, arsenal, bastion, bombe, canon, caracoler, carrousel, colonel, cocarde, escalade, escrime, embuscade, estafette, estafilade, fantassin, sentinelle, soldat, timbale, vedette,* etc.

In the early part of the seventeenth century there was a similar Spanish invasion, and French was enriched by about one hundred words: such as *abricot, alcôve, bizarre, corridor, duègne, mantille, sieste,* etc. At the same epoch a few words came from Germany, several wars having more than once brought its inhabitants into contact with the soldiers of France: *bivouac, blocus, fifre, havresac, loustic, lansquenet, obus, rosse, trinquer, choucroute, kirsch, nouille, graver, valser.* The influence of the Précieuses (see FRENCH LITERATURE) ought not to be ignored. A few illustrations of expressions coined by them and subsequently taken up in the current language may be of interest here: *être de qualité, un procédé tout à fait irrégulier, une chose du dernier bourgeois, donner dans le vrai, avoir des lumières sur un sujet, avoir l'intelligence épaisse,* etc. The Académie Française, founded 1635 (see ACADEMY), has always taken a rather conservative attitude. The policy of its members has been from the beginning to record (*constater*), not to innovate. The eighteenth century is the period in which France has exerted the most remarkable influence over European civilization. The glorious reign of Louis XIV. had indirectly contributed to make French an international language. It was recognized as such not only by politicians and by the higher society in every country, but even by the scholars who used it in their books to increase the number of their readers. It was a few years after the death of Voltaire and Rousseau that the Academy of Berlin established a prize contest on the three following questions: "Qu'est-ce qui a rendu la langue française universelle? Pourquoi mérite-t-elle cette prérogative? Est-il à présumer qu'elle la conserve?" The enthusiastic answer of Rivarol, known as the "Discours sur l'universalité de la langue française," was crowned. The language may have increased in accuracy, clearness, and elegance during the eighteenth century, but it acquired no new qualities. It may be said that by rendering it too perfect, Voltaire robbed French of a part of its strength, of its wealth, and of its originality.

The Revolution gave birth to a number of new expressions. The Académie had been suppressed by a decree of August 8, 1793; the 'Sections de Grammaire et de Poésie' of the Institut (founded in 1795) took provisionally its place. An edition of the *Dictionnaire* was, nevertheless, published in 1798 by the new men, and as they did not dare to introduce into it the words that had been recently coined, they put them in an appendix. Some of them have disappeared, some have remained. Among the latter are: *administratif, aéronaute, assignat, bureaucrate, carmagnole, centralisation, club* (pronounced clob), *décade, démoraliser, divorcer, fédéraliser, guillotine, guillotiner, monarchiste, polytechnique, révolutionner, septembriser, terrorisme,* etc. Most of them, as may be seen, are clumsily constructed. In the early part of the nineteenth century the Romanticists tried to bring new life into the language by adopting French words which had been given up in the course of previous periods. Victor Hugo says of himself, that he has

> " tire de l'enfer
> Tous les vieux mots damnés, légion sépulcrale."

This, however, was imitation of life, not life itself, and the movement soon died out, until a new and still less successful effort in the same direction was made by the poets of the Symbolist School (especially by the group of the Romanistes) in 1896. (See the *Glossaire* by Plowert—pseudonym for Paul Adam.) Two events of great importance took place in the second half of the nineteenth century. First, the cosmopolitan tendency common at this epoch to all European languages made itself felt in French. Its most noticeable result is the influx of English words: the more one advances, the more Anglomania seems to gain ground. All attempts to check the movement have proved vain. Endless lists of these borrowed terms have been made by scholars: *bol, boxe, bouledogue, châle, chèque, clown, cabbage, dandy, drainer, fashionable, groom, hall, humour, lunch, meeting, plaid, speech, sport, square, tender, ticket, toast, touriste, tunnel, verdict, wagon, whist,* etc. The second event is the still greater invasion of scientific terms which are common to all countries: *photographie, télégraphe, téléphone, anémométrie, antalgique,* etc. This double current results naturally in a continual proportional decrease of the stock of genuine French words. The purity and the beauty of the language do not gain by it either, and Petit de Julleville's statement seems to be correct—namely, that the new terms have "démesurément grossi plutôt qu'enrichi le vocabulaire." Littré, Nodier, Jullien, Eggar, Darmesteter, Brunot have raised their voices in vain in the sense of Petit de Julleville. The Académie itself can no longer resist; no less than 2200 neologisms were inserted in the seventh edition of the *Dictionnaire* in 1878.

The present state of the French language may be tabulated roughly as follows, taking as our basis the 32,000 words of the last edition of the *Dictionnaire de l'Académie:*

Of Latin stock	3,800
Of early Germanic origin	400
By derivation from primitive words (such as *richard, enrichir,* from *riche; pauvrette,* from *pauvre*)	7,800
Of foreign and scholarly origin	20,000
	32,000

Moreover, the style cannot be said to have improved. The simultaneous influences of science and realism have dried it up, and that of the newspapers, which grows daily, is a constant source of corruption. However, a few individual writers, like Renan and Anatole France, Remy de Gourmont and Mirabeau, in the second half of the nineteenth century, as Châteaubriand at its opening, have gloriously upheld the traditions of pure and elegant French.

French is used by about forty million people. It is the language of the greatest part of France (Brittany and a few southern districts only being excepted), of part of Belgium and Switzerland, and part of Canada. In Louisiana it is fast disappearing. If, owing to the growing importance of economic interests in the world, English has become the predominant language in civilized countries, French has, nevertheless, retained a part of its prestige and is still considered the most refined among the leading idioms of the earth.

GRAMMAR AND SYNTAX. For the early period, see ROMANCE LANGUAGES. For a long time no uniform system of orthography existed. If one reads, for instance, the fable of "The Wolf and the Lamb," by Marie de France (thirteenth century), it will be found that within thirty-eight lines the word for lamb is spelled in six different ways, and that for wolf in four. The example of Rabelais is often quoted, who wrote the word for oil in three different ways within the space of six lines. We have seen that the regulation of the language began in the sixteenth century. At once two schools were formed disputing over the best method of spelling; one of these demanded etymological, the other phonetic orthography. As erudition was much in favor at the time, the phonetic system had to yield, and furthermore a number of useless letters were wrongly introduced under the pretext of etymology: *d* in *poids, b* in *debvoir, l* in *chevaulx, veult,* and even *peult; dîner,* which is really a contraction of *déjeuner,* was written *dipner,* as if from the Greek δειπνεῖν.

In the seventeenth century a number of these letters were dropped, but new attempts at phonetic spelling failed once more. Grammar and syntax at this period are still in a state of disorder. The greatest writers are at variance as to the gender of certain words; the existence of rules for the use of the partitive article and of the personal pronouns is only vaguely suspected; the comparative is occasionally used for the superlative; the participles, present and past, agree or do not agree at the will of the writer. It was, however, at that epoch that the present rules of the agreement of participles was formulated by Vaugelas, in his *Remarques sur la langue française.* Briefly, it may be said that the seventeenth century observed the logical rather than the grammatical connection of words.

In the eighteenth century the rules established during the previous period were gradually carried out, and the liberties of syntax and orthography were dropped one by one. Owing to the influence of the experimental philosophy, requiring precision of style, the sentences became gradually shorter, while the long harmonious period of the classical age fast disappeared. Already at the close of the seventeenth century, Bayle protests against this simplification of style, which he considers a degeneration. "Ils recommencent une période à chaque ligne; c'est prendre le parti le plus facile; un parasseux s'accomode fort de cela." The Académie, in the 1742 edition of its Dictionnaire, drops a number of double letters, replaces the *s* by a circumflex before a consonant (*blâme* for *blasme*), and in a few cases substitutes an *i* for the *y*. In the edition of 1762 other innovations have to be recorded—namely, the distinction of *i* and *j* and of *u* and *v*.

Voltaire had tried in vain to bring about the use of *ai* instead of *oi* in the endings of verbs, according to pronunciation, but this reform was not adopted by the Académie till the edition of 1835. Except for this change, the language of the nineteenth century has remained on the whole stationary. The last decade, however, has been an era of orthographic reforms. For a long time individual efforts in that direction, made by prominent men (Didot, Littré, and others), had remained without effect. But since 1890 societies have been organized in France, Belgium, and Switzerland in order to bring about the desired improvements. They have a special organ, *Le Réformiste,* edited by Jean Barès, who made his fortune in South America and devoted considerable sums of money to the cause. A first set of reforms has been officially introduced by the French Minister of Public Instruction in an edict of February 26, 1901. Other changes are contemplated.

Phonetics. For early period, see Romance Languages. In the sixteenth century the pronunciation of the letters was as variable as orthography. *A* and *e* were interchangeable; the same is true of *ou* and *u*, *ou* and *eu*, *oi* and *ai*. The *e*, rarely accentuated, assumes different sounds. The consonants *s* and *z*, *s* and *r*, are used freely, the one for the other, *oiseau and oizeau;* and while in most cases one of the two forms has disappeared, both *chaise* and *chaire* have continued to be used simultaneously, though with different meanings. Phonetics are in close connection with orthography, and they have been studied with great care since the middle of the nineteenth century, especially with a practical object in view. Lesaint, Vogel, and, above all, since 1887, Paul Passy should here be mentioned. Passy's little treatise, *Les sons du français,* is widely known. Ch. Nyrop, a Dane, has also made for himself a reputation in this domain. His *Manuel phonétique du français parlé* (1902) is a model of patient, accurate, and impartial labor. In America, Professor Grandgent, of Harvard University, has employed the phonetic method with success in his widely used school books.

Versification. The chief element of Latin poetry was the quantity of the syllables. This has been altogether given up in French versification. A few poets, especially in the sixteenth century, Baïf and Jodelle, for instance (see French Literature), under the influence of the Renaissance, tried to write French poetry according to the Latin system. They never succeeded in producing anything satisfactory.

The elements of French versification are three: (1) The number of syllables, from twelve down. The mute syllables at the end of a verse never count; in the middle of the verse they sometimes count, sometimes not; the number changes more or less according to the epoch. In the Middle Ages the poet was very free; in the classical period he was less so. The Symbolists of the end of the nineteenth century have frequently allowed themselves as great a liberty as the poets of the twelfth and thirteenth centuries. (2) The accentuation. The verse must always end on an accented syllable, and if the verse is divided into smaller parts (e.g. 6 + 6, 4 + 4 + 4, 6 + 4, 4 + 4, etc.), each part in its turn must end on an accented syllable. By accented, one must understand the last syllable of a word of importance for the meaning conveyed, or an important monosyllable, such as a noun or a verb. Articles, conjunctions, and prepositions are rarely in place as accented syllables. (3) The rhyme. The original form is the assonance, i.e. the repetition at the end of a verse of a vowel sound. We find, for instance, the following assonances in a stanza of the *Chanson de Roland: abe, able, abre, ace, aile*, etc., or *i, id, ilz, vi*, etc. Rhyme is only a more perfect assonance, the letters following the vowel being also made to agree, thus *courage, village.* Still later the consonant preceding the vowel of the rhyme was required to be the same in both words (*consonne d'appui*); thus, *orage, courage.* The latter is called 'rime riche' or 'pleine,' while the other one is only 'suffisante.'

Different rules concerning the rhyme were added in the course of time: The rhyme was to connect verses two by two; in the sixteenth century it was decreed that two masculine rhymes (i.e. ending on a sounded syllable, like *amour, départ*) must alternate with two feminine rhymes (i.e. ending on a silent *e*, like *table, fille*). The result of these and other rules contributed to make French poetry more regular, but also more monotonous. The yoke of the narrow code of versification established by Malherbe and Boileau in the seventeenth century was not shaken off until the time of Victor Hugo and Romanticism. Even their attempts to gain more liberty were temporarily crushed by the poets of the Parnassian School from 1866 onward. The fight was, however, taken up again and victoriously carried out by the Symbolists: the *vers libre* was the outcome of their sweeping reform. According to them everything, the number of syllables, accentuation, rhyme, depends altogether upon the subjective criterion of each writer; there are as many forms of versification as there are individual poetic feelings. Few of the Symbolists made much use of the freedom thus regained, and a state of equilibrium has slowly come about since the excitement of the contest has passed away. Symbolists have become more inclined to recognize traditional principles, while their opponents have agreed to allow considerably more freedom to the individual tastes of the artist than was formerly the case.

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FRENCH LITERATURE. Eighth Century. The earliest sources of information on Old French are the dictionaries or 'Glossaries' of Cassel and of Reichenau, the former giving translation of Romanic or Old French terms into Old Germanic, the second of Latin words into Romanic.

Ninth Century. The first Romanic text that has come down to us gives the oaths interchanged at Strassburg in 842 between the two grandsons of Charlemagne, Louis the German and Charles the Bald, against their brother Lothair.

Tenth Century. The earliest literary documents which are in our possession have all a religious character; they are the "Cantilène de Sainte Eulalie" (a short song celebrating the martyrdom of the saint); the "Fragment de Valenciennes" (homily on the prophet Jonas); a poem on the Passion of Jesus Christ; a Life of Saint Léger.

Eleventh Century. A Life of Saint Alexis. To the end of this century belongs the flowering of the national epos, the *Chansons de Gestes*. These were long poems relating the heroic deeds of Christian knights (*gestes*, Lat. *gesta*, deeds); they seem to have been composed, in most cases, by the reunion of smaller popular songs. There is, however, considerable discussion on this point. At first the chansons were usually sung by the poets themselves, called *trouvères* in the north of France and *troubadours* in the south; later on this became the function of a particular class of men called *jongleurs* (*joculatores-jogleors*) or *ménestrels*. Both the poets and the singers were for a while a great power in the society of the Middle Ages, as they were able to make and unmake the reputation of a baron by what they chose to sing of him or of his ancestors. Their influence has been compared to that of the newspapers of later centuries. They allowed themselves to be bribed, and the kings and the Church had to make severe laws against them. This, however, was not the case from the beginning. The authors of the chansons drew their inspiration mainly from three different sources, and their poems belong accordingly to one of the three groups known as the French, the Breton, and the Classical Cycles.

The *Cycle de France* deals especially with French heroes who had put their arms at the service of God and the Church. The central figure is Charlemagne, who is made the great champion of Christianity. The task ascribed to him is the same as Christ's—to conquer the world for God. The great Emperor was represented as surrounded by his vassals, as Christ by His disciples. There were twelve chief barons, the peers of France, as there had been twelve Apostles; one of the Apostles had been a traitor, so there was a traitor (Ganelon) among the twelve peers. God repeated in favor of His kingly servant the miracles He performed formerly for His chosen people. He stopped the sun in its course in order to allow the Christian knights to complete the extermination of the pagans, and at times He sent down His angels to deliver heavenly messages and to help His soldiers in case of great danger. The most ancient, beautiful, and famous of the epics of this group is the *Chanson de Roland*, composed probably at the end of the eleventh century, containing about 4000 verses, whose author is not known. The rear guard of Charlemagne, headed by Roland, is attacked and cut to pieces in the pass of Roncesvalles, in the Pyrenees, and none escape. It is on this rather thin theme that legend worked and brought forth the great chanson in three parts: the betrayal of Roland by Ganelon, the death of Roland at Roncesvalles with the eleven other peers and 20,000 men, and the avenging of Roland achieved by Charlemagne. The sincere Christian spirit underlying the whole poem is wonderfully well shown in the beautiful figure of the bishop-knight Turpin. Other remarkable chansons of the Cycle de France are: *Aliscans; Raoul de Cambrai; Garin le Lorrain; Les quatre fils Aymon; Ogier le Danois.*

The *Cycle de Bretagne* betrays an altogether different spirit, as already shown by the second title often given to it, *l'Epopée courtoise.* Its chief poet is Chrétien de Troyes. Chivalrous deeds are here still in great honor; but they are no longer performed for the sake of God and the Church and 'la douce France.' A true Christian spirit is rarely present, despite the frequent allusions to the Bible or to ecclesiastical customs, and the use made of certain pseudo-evangelical scenes, as, for instance, in the rather extraordinary fusion of the originally pagan legends of Brittany with the Christian legend of the Holy Grail in the last and unfinished poem of Chrétien de Troyes, *Perceval le Gallois.* Love, conceived of as the source of all human virtues, and impersonated in fair ladies, may be said to be in this cycle the only power which claims the devotion of knights and barons. The central figure is here Arthur, or Artus, King of Brittany. He also is surrounded by twelve peers, with a traitor (Mordret). The twelve peers are seated at a round table, the symbol of the perfect equality of them all, hence the name of Knights of the Round Table often given to them. The principal poems of the cycle are: *Lancelot du Lac; Ivain le chevalier au lion; Erec et Enide; Merlin; Tristan; Perceval.* In no one does the spirit of the whole cycle come out in its good and bad features so clearly as in the romance of *Tristan and Iseut.* Under strict orthodox appearances the fundamental ideas at work are worldly love and pagan fatality, as shown in the symbolic passion-breeding-philtre, and in a number of other elements borrowed from the world of magic and of the fairies. Shorter poems, treating Breton legends, are in close connection with the Epopée courtoise. They are called the *lais Bretons,* and were sung like the epics. Here the influence of the Church has almost completely disappeared even in words. Love is the only motive, and the *esprit chevaleresque* in the modern sense of the word comes out still more unhampered than before, and even with a foretaste of *préciosité.* The scenes are laid in Brittany or in Wales. Marie de France is the author of these graceful poems. The best known, most refined, and at the same time most characteristic of her manner are: *Eliduc; Les deux amants; Le rossignol; Lyonec.* Among the *lais* of other authors may be mentioned *Tydorel; Guingamor; Graelent; Doon; L'Epine.* To the same kind of literature, although the heroes are not from Brittany, belongs *Aucassin et Nicolette,* a 'chante-fable' of the twelfth or thirteenth century. It gives, half in prose and half in verse, the story of the love of a noble's son for a slave girl, who finally turns out to be a king's daughter.

The *Cycle antique* is the least important of the three groups of epics. The authors turned to antiquity to find new material for their poems; they Christianized Agamemnon, Achilles, Ulysses, and all the heroes of Thebes, Troy, and Rome. The best known among their production is the *Roman d'Alexandre,* which contains some most extravagant adventures. It was written probably in the twelfth century, by Alexandre de Bernay, has 12,000 verses of 12 syllables, instead of 10, as in the *Cycle de France* and the *Cycle Breton.* The *Roman de Thèbes* and the *Roman de Troye,* belonging to the same group, are composed of octosyllabic lines.

All this mass of epic and chivalrous literature dealt with heroes taken from the higher classes of society, and was more particularly written for the nobility. There existed, however, simultaneously a more popular literature. Its products are less pretentious, but just as important as expressing the spirit of their epoch. They are short stories in verse. A good many among the earliest that we possess betray the absolute control of the Church over literature. The purpose of the *contes dévôts* or *contes pieux* was to foster faith among the people and at the same time to bring some consolation for the hardships of life to the lowly. The saints and especially the tender, compassionate Virgin prove always ready to fight the devil or intercede with God in behalf of faithful servants of the Church. As the Church lost its empire over souls, and lay authors began to write, the stories that were written assumed a more worldly character. If a few of the innumerable *fabliaux* or *fableaux* of the Middle Ages may be called didactic, by far the greater number have no other purpose than to entertain. Some are really artistic and graceful, with that touch of satire which is characteristic of the French people; but often the wit and humor are spoiled by coarse realism. Among the best may be mentioned the *Lai d'Aristote, Lai de l'oyselet, La housse partie, Le vair palefroi, Le vilain mire* (the original of Molière's *Médecin malgré lui*). The *fabliaux,* in which the talent for story-telling of the French nation is for the first time clearly shown, flourished especially during the twelfth and thirteenth centuries. They became rare in the fourteenth. Some of them were used at that time as themes for the stage, but most of them disappear temporarily, to be used again in prose two centuries later.

The satire on the different classes of society makes its appearance on a large scale during the same period in two long poems, *Le roman de Renart* and *Le roman de la rose.* The first is an animal epos of about 32,000 verses, not counting the 'branches' which were added later, and which would raise this number to over 100,000. The clergy, nobles, and villains are mercilessly criticised, though seldom with bitterness. Several collections of ancient animal fables written in Latin and known under the name of *Ysopets* (corruption of Esopets, or little Æsop), together with the *Bestiaires,* compositions ascribing moral traits to real or fantastic animals, had prepared the way for this kind of literature. Marie de France had translated a collection of fables into French verse. There are two sworn foes in the *Roman de Renart:* Isengrin, the wolf, and Renart, the fox, symbolizing strength and cunning. The general idea underlying the different episodes is that evil reigns supreme over society, brute force crushes weakness, cunning alone can overcome strength. In the *Roman de la rose,* allegory goes still further: the abstract ideas themselves are personified. A lover wishes to pick a symbolical rose, which grows in a symbolical garden. He is helped in his undertaking by Bel Accueil, Doux penser, Espérance, etc., meanwhile fighting Danger, Male bouche (slander), Jalousie, and so forth. The author of the first 4000 verses, Guillaume de Lorris, had left the poem unfinished. His sole thought had been to offer in a poetical form a kind of code of love. But, fifty years later, Jean de Meun added 18,000 verses, in which, with abundant scholarly references to Ovid and other ancient authors, he directed venomous attacks against women, and the conventional affected and false forms that love had assumed at this period, more especially in the higher classes of society. The success of the *Roman de la rose* was considerable not only in France, where its influence continued far into the seventeenth century, but all over Europe. Imitations and translations appeared everywhere.

Lyric poetry attained a great measure of popular favor during the Middle Ages, at first more particularly in the south of France. But a great number of ballades, pastourelles, chants-royaux, triolets, lais, virelais, sirventes, motets, were lost. We know, however, about 200 names of authors; moreover, 600 of these short poems have come down to us anonymously. There were a great many academies named Puys which encouraged lyric and sometimes dramatic poetry by organizing contests and awarding prizes. Among the poets that we know, a special mention is due, in the thirteenth century, to Thibaut, Count of Champagne and King of Navarre, and Colin Muset, an itinerant minstrel; and in the fourteenth century, to Christine de Pisan, Eustache Deschamps, Guillaume de Marchault, and chiefly to Rutebeuf, a Parisian trouvère of the Bohemian type, who took great interest in the events of his time, crusades, Church discussions, and university matters; besides his little masterpieces of lyric and satiric poetry, he wrote a few *contes dévôts, fabliaux,* and a miracle play. In the fifteenth century, Charles of Orléans, after his return from England, where he was a political prisoner for twenty-five years, and where he wrote most of his poems, made his brilliant court an asylum for letters and art. The greatest of these lyric poets up to the sixteenth century was François des Loges, known to fame as Villon. Owing to the resistless charm of his verses, to his absolute sincerity and spontaneity of inspiration, he has more than once been regarded as a kind of patron saint by the lyric poets of the nineteenth century. His chief compositions are two collections of short poems, *Le grand Testament* and *Le petit Testament.*

The theatre is the field in which the evolution of literature during the Middle Ages is most clearly shown. At first an institution of the Church, it gradually severed its connection with it, until finally theatre and Church came to be mortal enemies. The *drames liturgiques* of the eleventh century were representations in the churches of biblical scenes, more especially of the nativity and passion of Christ. They were written in Latin prose, and composed exclusively of sentences of the Holy Scriptures. Moreover, the actors were all *clerici*, that is, officers of the Church. Then came, in the twelfth century, the *drame profane* or *sécularisé.* The scenes are still biblical, but imagination is permitted to play a greater part; the language is no longer Latin, the actors are laymen, the stage is removed from the church to some public place. The *Représentation d'Adam* is the only piece preserved in its integrity that belongs to this early period of the French stage. The scenes are episodes from the book of Genesis. They are followed by predictions by the prophets of the coming of Christ, and the performance ends with a sermon describing the terrible signs which will form a prelude to the Last Judgment. In the thirteenth century the scope of the theatre is extended by the addition of miracle plays illustrating the marvelous deeds of the saints and especially of the Virgin. Rutebeuf has put in dramatic form the old fabliau of Saint Théophile, whom Mary frees from the clutches of Satan. *Le jeu de Saint Nicolas,* by Jean Bodel, another miracle of the same epoch, offers several scenes which have nothing to do with religion. Even a few purely comical pieces, such as *Le jeu d'Adam ou de le feuillée,* by Adam de la Halle, are now represented, though they seem to be an exception.

In the fourteenth century, which, on account of continual political and social disorders, was rather poor in literary productions of any kind, no new step toward emancipation from the Church is noticeable. The *Miracles de Notre Dame* remained the favorite theme, while scenes for religious plays are borrowed from all quarters, even from the *chansons de gestes* and *romans d'aventure.*

No form of literature is more popular during the fifteenth century than the theatre. *Mystère* is the name given henceforth to religious and even, though rarely, to non-religious plays, as for instance the *Mystère du siège d'Orléans,* which represents the rescue of that city by Joan of Arc, and the *Mystère de la destruction de Troie.* A feverish interest in theatrical representations took hold of the people at that period. The *mystères* were put on the stage with most elaborate machinery. Some of them had over 50,000 verses and lasted several days. Kings, nobles, and bourgeois vied with one another in their zeal for these plays. There was, however, something artificial about this universal enthusiasm; the plays are prolix; moreover, a tasteless abuse of the comic and coarse elements clearly indicates that the genre had outlived itself. In 1548 the Government had to withdraw the license to play from the 'Confrères de la Passion,' a society of actors in Paris, on account of the lack of decency in these so-called religious performances, and thus put an end to the mysteries. On the other hand, the profane theatre, free from the influence of the Church, was then coming to the front full of life and vigor.

The three principal kinds of plays in the second half of this century are the *moralités,* the *farces,* and the *sotties.* The *moralités* are a genre between the religious and the comic; sometimes grave, sometimes gay, they have a didactic purpose; frequently the characters are allegorical, like those of the *Roman de la rose,* which had set the fashion. The *farces* correspond on the stage to the *fabliaux* in the evolution of the verse story-telling; they are mildly satirical, the main purpose being to amuse. Coarseness is a common feature. Here belongs the first masterpiece of the French comic theatre, *L'Avocat Pathelin,* the author of which is not known. The sincerity of its humor and the keenness of its psychological observation are remarkable. The *moralités* and the *farces* were performed by special associations, such as the 'Confrères de la Basoche,' in Paris. The *sotties* were played by the 'Confrères des Sots' (fools), who only assumed the guise of folly as a stalking-horse for their wit, and for attacks on the clergy, nobility, and all other great personages of the day. Originally they were merely farcical interludes of the mysteries, but owing to their revolutionary character they had to be removed from the latter, and thus acquired independent existence.

Except in one domain, that of history, one may well say that prose does not count in French literature before the sixteenth century. Translations are few. The long *romans d'aventures* that have enjoyed a certain popularity since the thirteenth century are nothing but dreary, prolix repetitions in prose of the *chansons de gestes* and *épopées courtoises*. Leaving aside Wace's *Roman de Rou*, also called *La geste des Normands*, which is a treatment in verse of the history of the Dukes of Normandy during the tenth century, there are only a few historians deserving of mention: in the twelfth century, Villehardouin, who relates, in his *Histoire de la prise de Constantinople*, the story of the fourth Crusade, in which he personally took part; in the thirteenth century, Joinville (*Mémoires sur la vie de Saint Louis*), one of the vassals of Louis IX., whom he accompanied in his first expedition to the Orient; in the fourteenth century, Christine de Pisan (*Vie de Charles V.*), Alain Chartier (*Histoire de Charles VII.*), and especially Froissart, who in his *Chroniques* gives a somewhat disconnected but most vivid picture of the brilliant period of the Chevalerie (his authorship of many of the best chapters is now questioned); in the fifteenth century we have in the *Mémoires* of Commines the first connected account of political events from the point of view of a statesman; he has many ideas in common with Machiavelli, and is the precursor of many eminent philosophical historians in France, of the type of Bossuet, Montesquieu, Guizot, Thiers, Michelet, and Taine.

The sixteenth century was a period of transition, marked by the penetration into France of the ideas of the Renaissance. As regards the stock of ideas available for artistic purposes, it must be acknowledged that French literature had become rather thin since the time of the great epics. The studies of the classical authors came just in time to introduce a new stream of thoughts, and to inspire literature with a new life. In 1531 Francis I. had established the Collège Royal de France (now Collège de France), in which only Hebrew, Latin, and Greek were at first taught, other studies coming later. The influence of this institution was almost instantaneous, and a rich harvest of scholars was the result. Among them were such men as Budé, Daurat, Pierre de la Ramée, and especially two who acquired a world-wide reputation: Jacques Amyot, thanks to his admirable translation of the *Lives* of Plutarch, and Henri Estienne, the author of the *Thesaurus Linguæ Græcæ* (a work of immense erudition for the time), of the *Traité de la conformité du langage français avec le grec*, and of the *Précellence du langage français*, in which he protests against the invasion of Italian idioms that was taking place at this epoch, owing to the presence at Court of Catharine de' Medici. See FRENCH LANGUAGE.

The influence of the Renaissance was especially marked in the domain of poetry. The last poet in the manner of Rutebeuf and Villon was Clément Marot. In his epistles, ballades, elegies, epigrams, etc., we find the same wit and satirical humor as in the work of his predecessors. He was, however, by no means a stranger to the new opinions; his attitude in religious matters roused persecution, against which he had to take refuge in Italy, where he died. Moreover, his translations of authors like Vergil and Ovid prove his interest in ancient literature. But it remained for the poets of the next generation to give vent in their original compositions to the new spirit created by the Renaissance. Seven of them—the poets of the *Pléiade*, Daurat, du Bellay, Ronsard, Belleau, Jodelle, Baïf, Ponthus de Thiard—combined their efforts to bring about a new literary era. Their aspirations are set forth theoretically in du Bellay's *Défense et illustration de la langue française*, and practically in a great number of poetical writings. Ronsard is, by common consent, considered the head of the group. With the sole exception of tragedy, he endeavored to resuscitate all the genres of antiquity, even the epos (*La Franciade*), and furthermore adopted the Italian sonnet which had come in along with the Renaissance. The three directing principles of the school are: (1) their contempt for the light French poetry of the foregoing centuries, such as Villon's and Marot's; (2) their belief that one who wishes to do truly artistic work must study the ancients and imitate them; (3) their love for French vernacular. With regard to the last point, the work of the Pleïade has been long misunderstood. They have been accused of overloading French with strange words. On the contrary, they protested, as a matter of fact, against the tendency manifested by many unintelligent humanists to introduce into French a number of Greek and Latin terms which gave the language a false air of erudition, and made it heavy and inharmonious. A famous verse of Boileau on Ronsard,

> "Mais sa muse en français parlait grec et latin."

is responsible for the error of three centuries. The juster appreciation of the achievements of these poets, brought about by such authorities as Petit de Julleville, has destroyed the traditional belief in a supposed opposition between the views of the Pleïade and Malherbe. The latter, though himself convinced of his complete disagreement with Ronsard, was really aiming at the same goal, i.e. the purification and refinement of the French language and poetry. But while Ronsard was a true artist, who could rely upon his literary tact and feeling, Malherbe had the spirit of system, requiring rules in all places and at all times, to the detriment of spontaneity and inspiration. Malherbe's mantle was taken up later by Boileau, a man fashioned like him in the schoolmaster's world, and it is he who is responsible to no small degree for the stiffness of French poetry in the great century of its literature. The yoke of Malherbe was unbearable to most poets of real talent. Both Desportes and Berthaut followed Ronsard, while Mathurin de Régnier (the earliest representative of modern French satire) and Théophile de Viau deliberately attacked Malherbe, claiming the rights of freedom and originality.

On the stage, in the sixteenth century, there were a few rather awkward attempts at classical drama. Jodelle, one of the members of La Pleïade, entered the only field left untouched by Ronsard in his imitations of ancient literature, and wrote his tragedy, *Cléopâtre,* in which, for the first time in France, the three Aristotelian unities of place, time, and action were observed. Garnier followed in the steps of Jodelle. Larivey imitated servilely the Italian comedy, but had the honor to provide Molière with several suggestions.

In the domain of fiction, the short story in prose, already in favor in the fifteenth century when the collective work of the *Cent nouvelles nouvelles* appeared, is at its best with Marguerite de Navarre, the sister of Francis I. She wrote (perhaps not without help) the *Heptameron,* an imitation of Boccaccio's *Decamerone.* Part of her material is taken from the fabliaux. Bonaventure Despériers, her secretary, cultivated with success the same genre. The art of story-telling is also remarkably exemplified in the *Mémoires* of Monluc and of La Noue, and in Brantôme's *Grands capitaines* and *Dames galantes.* Brantôme did for the society of his time what Froissart had done for that of the thirteenth century. The writer who succeeded best in absorbing all that is good in antiquity, without losing the grace and freshness of French wit and humor, is Michel de Montaigne. In his delightful *Essais* the philosophy and belief of the Middle Ages are compared with those of ancient civilization, and the result is the refined and gentle skepticism which has made the "Que sais-je?" of its author a watchword for many cultivated minds ever since. What Montaigne had said, with seductive art and complete freedom from pedantry, was repeated with all the apparatus of logical demonstration by his friend Charron, in *De la sagesse.*

When Rabelais, the greatest literary figure in the sixteenth century, appeared, the conditions all over Europe were exceedingly precarious and the prospect for the future very gloomy. France had not yet recovered from the Hundred Years' War; Rome had been sacked by the French troops, and the Pope was no longer secure in it; Germany was the prey of terrible religious disorders, the Peasant Revolt, and the movement of the Anabaptists; finally, the Turks were threatening Christianity in the East. Yet Rabelais had the courage to break out in Homeric laughter. In his *Histoire de Gargantua et de Pantagruel* he ridiculed the murderous political wars of the time, the quarrels of the Church and of the different ecclesiastical orders, the pretentious and shallow erudition of the scholars, the revolting method by which magistrates and judges rendered justice—in short, the whole rotten civilization that had established itself on the ruins of the theocratic and feudal society. But he is not content with negations; his keen good sense suggests to him a number of useful reforms in all the domains of life, education, science, religion, politics. Some of these reforms have been realized, some of them we are still striving to bring about. The greatest social power in the Middle Ages, the Church, had been severely shaken. A new religious foundation for society was necessary. Calvin tried to provide it for France. He was so full of the idea of the absolute authority and power of God, that in his *Institution chrétienne,* a masterpiece of logic and deep faith, he does not shrink from the extreme consequences of the theory of predestination. His efforts against Rome were ably supported by Théodore de Béza, and especially Agrippa d'Aubigné, a man of wonderful personality, who fought with enthusiasm and untiring energy, with sword and pen, against the power of the Pope. His poem in seven cantos, *Les tragiques,* is one of the most powerful outcries of indignation the world has ever heard. To meet the danger of the domination of the League, a few devoted citizens (among them Pierre Pithou, Gillot, Passerat, Rapin) wrote a number of short pieces in prose and verse, in turn satirical, eloquent, comic, and grave, appealing to the patriotic feeling of their countrymen. These compositions were published in book form in 1594 under the title *La satire ménippée.* Another political writer of the same epoch was La Boétie, the friend of Montaigne, who in his book *Traité de la servitude volontaire* expressed even then opinions which were formulated two centuries later by Rousseau and by the leaders of the French Revolution.

The seventeenth century is known as the classic century of French literature. It differs from the sixteenth in its greater unity. It carried the French language to a point of literary perfection, a form that will be difficult to surpass. Two institutions more particularly contributed to this result: the Hôtel de Rambouillet and the Académie Française. The Marquise de Rambouillet brought together in her salon the most refined and cultivated people of Paris, and thus exerted a beneficial influence, moral, social, and literary. There Balzac, 'le seul éloquent,' first gave utterance to the great French 'période oratoire,' while Voiture was the foremost representative of the witty, light, amiable side of the French character. Other salons were formed on the model of the Hôtel de Rambouillet; that of Mlle. de Scudéry (*les samedis de Sapho*) deserves special mention. The habitués of these salons are the 'précieux' and 'précieuses' of whom Molière was to ridicule so amusingly; yet one must not lose sight of the excellent refining results of these coteries. They are apparent, for example, in the *Lettres* of Madame de Sévigné, and in many other representatives of *Le style épistolaire* in that century and the next.

The Académie Française was first a private society of scholars, then transformed more or less willingly, in 1635, at the instigation of Richelieu, into an official State corporation. The Academicians were to publish a dictionary, a grammar, and a rhetoric. The dictionary alone was completed. Vaugelas, the author of the *Remarques sur la langue française,* contributed more than any other to this work. Among the other original members of the Académie are Conrart, its first president; the poets Chapelain, Maynard, and Racan; Balzac and Voiture; and Furetière, who was expelled for having published a dictionary before that of the Académie.

The great authority in literature, however, was neither the Hôtel de Rambouillet nor the Académie, but Boileau, who, with an undeniable critical talent, made and unmade reputations at will, seldom going astray in his judgments. Like

Malherbe, he formulated in his *Epîtres* and in his *Art poétique* a code of literature; whatever did not meet its requirements was pitilessly condemned. Poets like Théophile de Viau and Scarron, the creator of the *genre burlesque* (*Virgile travesti*), are among his victims. He had nothing but contempt for Ronsard and his school, and yet he himself accepted the ancients as the criterion of excellence and even became the chief advocate of classicism in the great 'Querelle des anciens et des modernes,' which raged through many years of the seventeenth century; while Perrault, who had started the debate, was the principal representative of the 'modernes.' Proceedings of so imperious a character were only the application to the field of literary criticism of the principle of authority which regulated the whole life of the seventeenth century, social, ethical, religious, artistic. If France received strong political unity at the hands of Richelieu and Louis XIV., it was at the expense of that individuality which had characterized so many authors of the anarchistic sixteenth century. Protestantism had been crushed out, not so much on account of its intrinsic defects as by reason of political necessities. Everywhere the same system of government prevailed: anything threatening to become *imperium in imperio* was doomed to suppression or transformation, while only what accepted and reflected directly or indirectly the social ideal of the time was allowed to develop. Bossuet was really the incarnation of his century in literature; the authority of God, the authority of the Church, the authority of the King, are the themes of his works, and the grandeur which cannot be denied to this epoch can be seen in each sentence written by the 'Aigle de Meaux,' whether in his splendid *Oraisons funèbres*, *Sermons*, and *Discours sur l'histoire universelle*, in which the great of this world are like dust before God, or in his *Histoire des variations des églises protestantes*, and his attacks on Fénelon and Quietism, in which he affirms the absolute control of truth by the Roman Catholic Church, or yet again in his *Déclaration du clergé de France*, in which he defends the divine right of the King against the temporal pretensions of the Pope. The same is true of his contemporary Bourdaloue, even more famous than Bossuet in those days for his pulpit eloquence, and, though to a less degree, of Fléchier. Even Fénelon, 'le cygne de Cambrai,' by humbly accepting the condemnation by Rome of his *Essais sur les maximes des saints*, showed how deep-rooted the idea of social and ecclesiastical hierarchy was in the temperament of that remarkable epoch. He had also to learn by bitter experience what it cost to suggest (in the *Voyage de Télémaque*, written for his royal pupil, the Dauphin) modes of government which did not agree with the autocratic ways of Louis XIV.

In the drama the notion of authority takes a somewhat different form, but is as much emphasized as in Bossuet. Corneille's tragedies, *Le Cid*, *Horace*, *Cinna*, *Polyeucte*, and his comedy *Le menteur*, preach an unconditional surrender to the laws of honor and conscience, of God and the State. Racine, though his artistic tact raised him in many respects above the narrow spirit of his age, is not free from it, nevertheless, as is well shown in his fundamental thesis of the submission of man to his passions (*Andromaque*, *Phèdre*, *Iphigénie*, *Bérénice*, *Britannicus*), and in his illustrations of the omnipotence of God in his later religious plays, *Esther* and *Athalie*.

There are, however, a few men in the seventeenth century who do not assume this attitude of deference to conventional grandeur and worldly power. Chief among these is Molière (pseudonym for Jean Baptiste Poquelin), who attacks in his comedies, on the one hand, the *idola fori* of his contemporaries, as for instance the current affectations of the society of his day (*Précieuses ridicules*, *Femmes savantes*, *Bourgeois gentilhomme*), and the false erudition of scholars, especially ignorant physicians (*L'amour médecin*, *Médecin malgré lui*, *Malade imaginaire*); and, on the other hand, the general views of humanity, as in *L'avare*, *Tartuffe* (religious hypocrisy), *Don Juan* (affectation of unbelief), and *Le misanthrope*, his masterpiece.

Descartes refused to accept the traditional Catholic foundations of metaphysics. He invented a system of his own, resting on the proposition "Je pense, donc je suis" (I think, therefore I am); but he had to take refuge in Holland, in order to complete and give free expression to his new philosophy—a creed not so different from the orthodox as might be imagined if we were to form our judgment solely from the negative part of the doctrine (*Discours sur la méthode*, *Méditations philosophiques*, *Principes de philosophie*, *Traité des passions de l'âme*). Thanks to a most cautious and subtle way of expressing himself, Malebranche, Descartes's pupil, was able to publish his long treatise *De la recherche de la vérité*, and remain in Paris without being prosecuted. In the line of theology the whole group of the Jansenists, who resembled in some respects the Protestants, especially in their condemnation of the Jesuit principles of morality, was subjected to persecution. They produced some of the most powerful and original writers of the time: Antoine Arnauld, Pierre Nicole, and, above all, Pascal, who has often been called the most profound of French thinkers. His literary bequest is the *Pensées* (notes prepared for a work on the truth of the Christian religion and published after his death), and the *Lettres provinciales*, a most forcible and effective satire on the Jesuits. Among the moralists of this epoch are La Bruyère (*Les caractères*, *Pensées*) and La Rochefoucauld (*Maximes*); better described perhaps as clever piecemeal psychologists than as powerful ethical philosophers. Madame de Maintenon, in her letters, deals chiefly with problems of education. Though a progressive spirit is shown in some of her theories, she is on the whole, like Fénelon, a being of her time.

La Fontaine, whom his contemporaries nicknamed 'Le bonhomme,' is a writer of marked originality. In his charming *Fables* and in his *Contes* (which remind one in their substance and form of the old *fabliaux*) we have once more a representative of the genuine 'esprit français' as it existed before the Renaissance. He had fed on all the poetic treasures of antiquity that came in his way, and created them, as it were, anew, by his graceful, light, and artistic verses.

Another man who freed himself from the conventionalities of the seventeenth century, and restored the connection with the national artistic tradition of France, is Charles Perrault, the author of the naïve and humorous nursery tales.

His *Contes* found hosts of imitators, even late into the eighteenth century.

The endless novels of this period also indicate a revival of the literature of the Middle Ages, particularly in the style of the *Roman de la rose*. But the reconciliation of natural feelings and conventionality is here far from being so complete as in the writings of the two authors just mentioned. The lack of harmony between the two tendencies is disagreeably in evidence in all these tedious novels, many of which extended to ten volumes. The only outcome of their efforts is an intolerable sentimentalism expressed in the exasperating jargon of 'précieuses,' who play their parts in the garbs of shepherds and shepherdesses. Let us mention only La Calprenède, and Honoré d'Urfé (*L'Astrée*), and Mlle. de Scudéry (*Le Grand Cyrus Clélie*), who invented the *Carte du tendre* (map of tender feelings), and did in prose what Racan in his *Bergeries* had done in verse and in drama. The first example of the French novel, in the modern sense of the term, is Mme. de la Fayette's *Princesse de Clèves*, but it stands by itself. Coarseness disfigures Cyrano de Bergerac's satirical *Histoire comique des états du soleil et de la lune*, and his comedy *Le pedant joué*. Scarron's *Roman comique* is a faithful picture in the form of fiction of an actor's life in the century of Molière.

The memoir literature continues to enjoy favor in France. La Rochefoucauld and the Cardinal de Retz are the two best representatives in this field at this time.

We reach the threshold of the eighteenth century with the *Mémoires* of Saint Simon, who portrays in a lively style the still brilliant, but now thoroughly corrupt, Court of the last years of the 'Roi Soleil.' Although rotten at the core, so strongly organized a society as that created by Richelieu and Louis XIV. could not fail to hold together for a time. Everything, literature included, continued for a while on the old lines, and until far into the eighteenth century we have nothing but a servile imitation of the seventeenth century. Regnard and Dancourt are imitators of Molière; Crébillon takes up the bequest of Corneille and Racine; Chamfort and Rivarol once more echo the spirit of the 'précieuses'; Florian sometimes reminds one of La Fontaine; Massillon follows in the steps of Bossuet, and d'Aguesseau is a master of pompous style in political eloquence. J. B. Rousseau and his disciple Lefranc de Pompignan are lyric poets whose writings are in the style of the earlier century; the same is true of Louis Racine, the son of the great dramatist, and also true perhaps of Gilbert; it is only at the end of a life which spanned the century that even Fontenelle learns to appreciate the aspirations of the new generation in his work of popular science, *De la pluralité des mondes*. Besides those just mentioned, a number of authors spend remarkable gifts in fruitless activity. Their works, although sprightly and witty, hardly contributed anything toward progress in literature and art. Among them are Marivaux, who wrote exquisite comedies; Piron, Gresset, even Nivelle de la Chaussée, with his *Comédie larmoyante*, and Ducis, who tried to introduce Shakespeare into France. At the same time there are on the stage a few plays which announce clearly enough the times that are approaching. Le Sage, in his bitter *Turcaret*, and Destouches, in *Le glorieux*, expose the moral unworthiness of those who claim to rule over their fellowmen by divine right; while Diderot, in *Le fils naturel*, Sedaine, in *Le philosophe sans le savoir*, and Beaumarchais in *Figaro*, already affirm deliberately the merits of the *bourgeoisie*. In his drama *Charles IX., ou L'école des rois*, M. J. Chénier directly attacks monarchy as a system of government. And soon after, the brother of the latter, André Chénier, strikes his lyre in favor of the newly conquered liberty; he was, however, to pay with his head for the indignant and patriotic protests that he uttered in his *iambes* against the horrors of the Terror. Three other descriptive poets, contemporaries of Chénier, call for a passing mention here: Delille (for his poem *Des jardins*), Lambert (*Les saisons*), and Roucher (*Les mois*). The gospel of tolerance gains ground daily, thanks to works like Le Sage's *Gil Blas*, and Marmontel's *Contes moraux*, *Bélisaire*, and *Les Incas*, in the domain of the novel, while men like the Abbé Fleury and Rollin in education, and Vauvenargues in ethics, slowly and quietly suggest positive reforms.

If the list of highly talented men in the eighteenth century is very long, that of writers of real genius is short, as compared with the preceding period. At the opening of the century there is Bayle, the scholarly and bold author of the *Pensées sur la comète*, and of the *Dictionnaire historique et critique*. As early as 1697 all the traditional doctrines that will be swept away by the Revolution are made a target for his dialectic, and many new ones are announced. He was a precursor of Voltaire. Besides the advantage of a timely appearance, Voltaire had the considerable advantage of a clear and beautiful style. He is the incarnation of the eighteenth century. In one part of his work, nevertheless, Voltaire plainly belongs to the group of continuators of the traditional and classical literature. His dramas, except a few like *Mahomet* (preaching tolerance), which betrays the age in which its author lived, are patterned exactly after those of the seventeenth century; his *Henriade*, an epic poem, is another specimen of a literature that belongs still more surely to the past; and the *Siècle de Louis XIV.* is the glorification of that France whose standards of life he contributed to tear down in so many other writings. In the *Essais sur les mœurs et l'esprit des nations*, he takes up history at the point where Bossuet had left it in his *Discours*, namely with Charlemagne; but while Bossuet had shown that religion is the great leading power of a progressive world, Voltaire proceeds to prove that religion is the mother of all crimes and has positively prevented progress. Voltaire's criterion was plain common sense, and from this stronghold he attacked indifferently the methods by which he considered that the Church took advantage of the imbecility of human nature (*Lettres philosophiques*). the theistic and optimistic systems of philosophers and theologians, particularly the doctrine of the best possible world of Leibnitz and Shaftesbury (his poem *Le désastre de Lisbonne*, his *Contes philosophiques*, *Candide*, *Zadig*), and the men who deny the existence of God (Si Dieu n'existait pas, il faudrait l'inventer). His God, however, is only that of Deism, i.e. a Creator who does not interfere with his creation; in other terms, he does not believe in Providence. Voltaire's action and influence are essentially negative. The only part of his work in which he does not attack others is that in which he tries to spread the scientific ideas acquired in his sojourn in England, especially those derived from Newton's books.

It is from England also, from the empirical philosophy of Bacon and of Locke (whose principal disciple in France was the Abbé Condillac), that the group of writers known as 'le parti des philosophes' borrowed the new conception of the world that they substituted for the traditional philosophy, which they had rejected. They embodied the results of their common efforts in the *Encyclopédie.* Diderot, who, though somewhat capricious, was one of the profoundest writers of the time, made this undertaking the work of his life, enrolling his most distinguished contemporaries as his collaborators. D'Alembert, the mathematician, wrote the *Discours préliminaire,* which established his fame as a writer. It is impossible to mention all those who were connected with the *Encyclopédie* and the 'parti des philosophes.' It is enough to name Mably, Raynal, Grimm, Helvétius, and Holbach. The salons of the time, conducted by a number of very keen and intelligent women, did much to spread the new beliefs. In the field of sociology and politics the most important writer is the Baron de Montesquieu. He began with a most happy and brilliant criticism of the customs of his countrymen in the *Lettres persanes.* Later, in the *Considérations sur les causes de la grandeur des Romains et de leur décadence,* and in his more elaborate work, *L'esprit des lois,* he does away with the merely speculative and *a priori* method of Bossuet in treating the philosophy of history, and replaces it by the empirical and comparative method which has since been applied with greater thoroughness, but not with greater skill or attractiveness, by modern ethnologists and sociologists. Duclos, in his *Considérations des mœurs du siècle,* has approached the same problems, though with much less genius.

The most far-reaching in its consequences of the philosophical principles of the eighteenth century was the return to nature. The affected cult of an unreal nature as it was found in the novels of the 'précieuses' had to go; and if we find an echo of it in Marie Antoinette's *hameau* at Versailles, no author of mark in the eighteenth century makes use of this old ideal. In 1735 the Abbé Prévost offered a first example of natural and passionate love in his novel *Manon Lescaut,* and a few years later the great naturalist Buffon proved that even in the society of the nobles a more truthful conception of nature was not excluded *a priori.* He had a mind of a most aristocratic form, and in his style continued the great traditions of the writers of the 'siècle de Louis XIV.,' yet he devoted his life to writing a monumental work, entitled *Histoire naturelle,* in which the nature that he studies with enthusiasm is one created by God, and not the one invented by ladies and gentlemen of the Court. Most of his opinions are no longer accepted, but they were original at the time, and well calculated to foster interest in a subject so long neglected by philosophers and scholars. Of a somewhat different character, but just as strong and sincere, was the love for nature as it appears in Bernardin de Saint Pierre's *Etudes sur la nature* and *Harmonies de la nature,* and in his romantic idyll *Paul et Virginie.* Full of chimerical ideas, both a poet and a Utopian, he might have been the most representative figure of his time in his chosen field had not Jean Jacques Rousseau forestalled him. An eccentric and restless genius, there can be no doubt that Rousseau provided not merely most of the ideas which the Revolution tried to put in practice, but also many of those that have been elaborated one by one in the literature of the nineteenth century by the romantic and even by the realistic schools. Extreme in everything, he wrote with an enthusiasm which could not fail to stir a society that had grown accustomed to hear only the dispassionate and cold speech of common sense and dry reason. Endowed with a strange combative disposition, he never rested till he had reached the very roots of the evils of his day; he was not content to attack any particular institution, Church, monarchy, or class privileges; his attacks were directed against society as a whole, and he declared the very system of civilization to be rotten, false, and contemptible. That man is a creature of nature, and that therefore nature must be his teacher, his mistress in everything, was with him a fundamental axiom. If he tore down in his *Discours sur les sciences et les arts, Discours sur l'inégalité, Lettres sur les spectacles,* he tried to reconstruct in the domain of education (*Emile*), in that of the family (*Nouvelle Héloïse*), and in that of sociology (*Contrat social*). The last mentioned is a treatise in which the author endeavors to trace the origin of every organized society to an original though tacit contract between all citizens; the latter freely decide as to the government they want. This implies not only taking away from the dominant class its privilege of ruling, but also the power of appointing and dismissing magistrates at will. The *Contrat social* became the Bible of the French Revolution; this was the authority to which it appealed when it justified the beheading of Louis XVI.

When the destructive storm of the great Revolution was over, Frenchmen realized that it was easier in theory than in practice to change an organization rooted in the tradition of hundreds of years. They were convinced, too, that the old society had not been absolutely bad in all respects. Accordingly, the first years of the nineteenth century appear as a period of reaction against the Revolution in the field of literature as well as in the field of politics. Joseph de Maistre preached in beautiful language on the unconditional return to the old régime, nay even to a mediæval theocracy. The belief in Providence was according to him the only satisfactory philosophy; the Church must rule over Europe, and kings be considered as the sacred representatives of God. Châteaubriand, though Catholic and Royalist, takes into consideration more than De Maistre the events of the eighteenth century. In his *Essai sur les révolutions* he maintains the uselessness of revolution, and later, having undergone terrible personal sorrows owing to the cruelties of the Terror, he finds consolation in the Christian faith ("J'ai pleuré et j'ai cru"). The *Génie du Christianisme,* written soon after, offers a kind of æsthetic religion for artists rather than a religion for humanity at large. Yet it enjoyed an immense success with his contemporaries, who were tired of negations and greeted with enthusiasm the old belief—even though in a somewhat unusual attire. Châteaubriand, however, is not entirely reactionary; he proves a true son of the end of the eighteenth century when, after his journey to America, he professes a warm admiration for the life of the uncivilized tribes he had visited, and for the grandeur of the scenery (*Les Natchez*, *Atala*). He is also a forerunner of the Romanticists in his half autobiographical story *René*, which with *Obermann* by Senancour and *Adolphe* by Benjamin Constant (the great orator of the Restoration), correspond in France to the note struck in Germany by Goethe's *Werther*. Madame de Staël's great achievement was the reestablishment of the connection with the eighteenth century, and especially with Rousseau; in fulfilling this task she shows hardly less passion or conviction than her master. In *L'Allemagne* she advocates the natural and rationalistic religion of Rousseau's *Vicaire Savoyard;* the same work brings out the idea of cosmopolitanism in the intellectual sphere of life which is to be found already in germ in Rousseau. The French Revolution had done away partly with political barriers; it seemed to Madame de Staël that a similar change must take place in the domain of art, and this prompted her to reveal the genius of Germany to her countrymen. Her two novels, *Corinne* and *Delphine*, defend—like the *Nouvelle Héloïse*—the natural rights of love as against the conventions of social life. The Romantic movement, which has also been traced back to Rousseau, is the most important literary event of the nineteenth century. No writer of the time is altogether free from its influence. Its purest product is Lamartine. Individualism had won the great battle begun a hundred years ago: the *Méditations poétiques* and *Harmonies poétiques et religieuses* are like a glorious cry of victory crowning the efforts of the eighteenth century. No bitter experience had revealed as yet the deception that awaits the self-worshiper. One would wish that Lamartine had died before he descended from the heights into the arena of political intrigues and soiled his lofty aspirations by contact with reality. His political career was a failure, though—or perhaps because—he was sincere.

Very soon, taking advantage of its first successes, Romanticism assumed an aggressive attitude toward Classicism. Victor Hugo became the leader of the new school, and was joined by Gautier, Sainte-Beuve, Vigny, Musset, Nodier. The great battle by Hugo himself in favor of Romanticism took place on the stage (*Cromwell*, with its important preface, *Hernani*, *Ruy-Blas*, *Marion Delorme*, *Le roi s'amuse*). Alexandre Dumas, the father, and Vigny (in *Chatterton*) supported him. The old school, however, regained a temporary popularity with Ponsard's *Lucrèce*, a play weak in itself, but put upon the stage at the psychological moment when the enthusiasm of the public for Romanticism was beginning to cool. The triumph of Romanticism was in any case of short duration. Some of the most prominent writers of the group quietly withdrew (Sainte-Beuve, Gautier), while others loudly voiced the bitter disillusion. The pessimistic but proud poetry of Vigny (*Poésies*) and the tragic youthful outcry of despair of Musset (*Les Nuits*, *Souvenir*) are the swan songs of Romanticism. In the domain of fiction, the passionate prose of the anarchistic George Sand (*Indiana*, *Jacques*, *Mauprat*) gradually lost its fervor, and in later years she abandoned the fanaticism of her youth, and sought the harbor of happiness in an old-fashioned, conventional society.

Ever since the Restoration, France has been in danger of a new era of revolutions, and the possibility of having to face another Terror led many to attempt a pacific settlement of the rising social and political difficulties. Among them were the poets Béranger and Casimir Delavigne; the political writers and orators P. L. Courrier, Benjamin Constant, Royer-Collard, Lamartine; the historians Guizot, Tocqueville, Thiers, Blanc, Michelet; the philosophers Cousin, Jouffroy; the socialist Proudhon; the Catholic writers Lacordaire, Lamennais, Montalembert. All the generous efforts of these men were finally brought to an end by the Revolution of 1848, followed three years later by the coup d'état of Napoleon III.

In the meantime, Victor Hugo's fame continued to increase. He was a giant well able to stand the final failure of Romanticism without being carried away in the disaster. Moreover, his conception of individualism had always been very different from that of Lamartine, Vigny, and Musset, and his understanding of the needed reaction against Classicism was more radical, more to the point, and also more according to the trend of ideas since the Revolution. This is the reason why he may be rightly considered the representative of the nineteenth century—the century of democracy—just as Voltaire was the high priest of the eighteenth. Hugo had endeavored to show that man is a tissue of contradiction, a mixture of good and evil, of beauty and ugliness, of grandeur and villainy, with the inference that a king or a nobleman has traits that make him, after all, a very inferior being, while—and this is the chief point—in the humble, the lowest in the social scale, are intimations of sublimity that render him the equal of the most highly honored among men. See particularly the dramas *Le roi s'amuse*, *Marion Delorme*, the novels *Bug Jargal*, *Notre Dame de Paris*, *Les misérables*, and, in the *Légende des siècles*, poems like "Les pauvres gens," or "Le crapaud." Not only are those traits not distinctly romantic, they are even characteristic of the school that was to replace Romanticism, namely, the Realistic. Another important feature that made Hugo a favorite with the masses is his optimism. Though a great satirist in *L'année terrible* and *Napoléon le petit*, his confidence in humanity and God was always predominant. This is, among others, the idea which inspires the whole *Légende des siècles*, poems in the epic style, in which the author wished to show how humanity rises constantly from a lower to a higher level of civilization and happiness.

Two other men in the first half of the century took pains to study man under both his ideal and his baser aspect, but, contrary to Victor Hugo's, their portrayals of characters have a pessimistic tone. The first of these is Honoré de Balzac, who, in his stupendous *Comédie humaine,* is so anxious to remain faithful to life that, for fear of incurring the accusation of undue indulgence, he shows a strong inclination to lay stress on the weakness of man. The titles of his best-known novels are: *César Birotteau, Eugénie Grandet, Le lys dans la vallée, Peau de chagrin, Le père Goriot, Séraphita.* The second was Stendhal (pseudonym of Henri Beyle), who, in his detailed studies of the psychological springs of human action (*Chartreuse de Parme, Rouge et noir*), seems to have still more deliberately assumed the cynical tone of skepticism as to the very possibility of goodness. The public was not ready for Balzac and Beyle, and a whole generation was to pass away before their efforts were duly appreciated. The old standards had first to be disposed of, and this was the task performed by men like Mérimée, Flaubert, Gautier, Barbey d'Aurevilly, and the poet Baudelaire. In turn bitingly sarcastic and humorous, they indicated the shallowness and pettiness which the advent of the bourgeoisie had introduced into art. Flaubert, d'Aurevilly, Mérimée, and Gautier still select the characters of their stories for the most part in the sphere of the romantic, but the method of treatment is evidently realistic. Flaubert's *Madame Bovary* (1857) is in subject and treatment the first great novel of the Naturalistic movement of the third quarter of the century. The victories of science and the success of pessimistic philosophy did much to promote the ultimate triumph of the cause of Naturalism. In the seventies, Zola published the first novels of his series *Les Rougon-Macquart.* The sub-title of the work, "Histoire naturelle et sociale d'une famille sous le second empire," is suggestive enough. To the author, and to the brothers Goncourt, who immediately preceded Zola in this newly opened path, man is a mere product of his *milieu* and of the physical laws of nature, especially those of heredity; therefore he can be understood only by means of scientific study, and true literature must be nothing but a collection of scientific cases carefully recorded. Zola was himself the disciple of the philosopher Taine, who had put forth the principle of his system in the introduction to his history of English literature. But Zola had taken only one-half of the theory, laying stress merely on the physiological causes that influence action; another disciple of Taine, Paul Bourget, studied in his novels particularly man's mental mechanism, as Beyle had done earlier, and represents the 'roman psychologique,' as Zola the 'roman naturaliste.' Bourget was attracted by the study of the female character on account of its complexity; for the same reason he deals by preference with society women rather than with women of the people. His most characteristic novel is *Le disciple;* see also *Mensonge, Cœur de femme, Crulle énigme, Duchesse bleue.* Two of the principal writers in the two domains of the naturalistic and the psychological novel are the genial Alphonse Daudet and Edouard Rod. They allow a touch of human feeling to animate their books, and therefore, although in some respects perhaps inferior from the artistic point of view, enjoy much favor with the bulk of the public. It is not always possible to decide whether an author belongs to one or the other of these two schools; this is, for instance, the case with Ferdinand Fabre, and with novelists like Edmond About, or Cherbuliez. The extreme theories of Naturalism were soon given up. Five disciples of Zola—Rod among them—published a protest against their former master's conception of literature. Zola himself, in his *Trois villes* (*Lourdes, Rome, Paris*), renounced his pessimistic views of humanity, and in his four *Evangiles* (*Fécondité, Travail, Vérité, Justice*), of which only three had been written at the time of his death, the note of optimism and even of Utopianism is dominant. If Naturalism has died out, it has, however, left noticeable traces in the works of novelists up to the opening of the twentieth century. The brothers Rosny and the brothers Margueritte are almost direct descendants of Zola, with a slightly more pronounced tendency toward moralizing, while Maurice Barrès and Paul Adam, and L. Descaves discuss not only social but political issues. Again a tendency to use the psychological method is manifest in authors like Prévost, 'Gyp,' Estaunié, Mirabeau, and Hervieu. Theuriet, Bazin, and Pouvillion are realistic novelists of rustic life. The master of the naturalistic short story is Guy de Maupassant. Some view him as a greater writer than Zola himself. His sober style seems to be an improvement even upon that of Mérimée, who was usually considered the incomparable model in this field. The stories of Coppée may be mentioned here as belonging to the realistic style, tempered by deep sympathy with the working classes. Masson Forestier represents with talent the detective story. The names of Villiers de l'Isle Adam, Rémy de Gourmont, P. Louÿs, de Régnier offer the best examples of novels written by the modern Symbolists.

As to the stage, since the fight of Romanticism, we record the appearance of the prolific Scribe, and the original note struck by Alexandre Dumas, the son, and E. Augier, in their realistic, and at the same time hortatory, social dramas (*Dame aux camélias, Demi-monde, Fils naturel, Affaire Clémenceau* by the former, and *L'aventurière, Le fils de Giboyer, Maître Guérin* by the latter). They were the forerunners of realism in the drama. For years Labiche, Sardou, Meilhac, Halévy, and Pailleron contrived clever novelties to amuse the stage-goers. Meanwhile the theatrical ventures of Zola and Daudet had failed, and it was not until 1882 that Naturalism scored a triumph with *Les corbeaux,* by H. Becque. The success was, however, of short duration, for Naturalism degenerated soon into what has been called 'le théâtre rosse.' Since that time all sorts of plays have appeared on the Parisian stage; satirical by Lavedan and Donnay, social and moral by Curel, Hervieu, and Brieux. The most popular playwright has been E. Rostand. His *Romanesques* was a belated satire on Romanticism; in *Cyrano de Bergerac,* his greatest success, the satiric and serious elements are mixed in a most disconcerting manner; while *L'Aiglon* is a more or less happy attempt at historical drama; a genre cultivated also by Hennique, Coppée and Sardou. Finally, we should mention a group of artists specially characteristic of an epoch in which anti-naturalism is the dominant note; the Symbolists Villiers de l'Isle Adam, Saint Pol Roux, P. Claudel, and above all, Maeterlinck. The latter, however, has entered a more usual path in his *Monna Vanna* (1902). A resurrection of the Middle Ages, fashioned on its miracle plays, has also taken place on the eve of the twentieth century, with M. Bouchor and Vicaire; the *Théâtre de l'Ame,* by Schuré, also has a half mystical note.

The poetry of the last third of the nineteenth century illustrates remarkably well the oscillations of the literary ideals during this period. The spirit of Naturalism has made a deep imprint on the devotees of the Muses known as the *Poètes du Parnasse* or *Parnassiens.* Banville and Th. Gautier insisted above all upon a very accurate and, in appearance, scientific verse construction; a pornographic inclination is evident in Baudelaire's *Fleurs de mal,* a pessimistic note in Leconte de Lisle, and a psychological tendency in Sully Prudhomme; while one notices in Coppée, Richepin, Mendès, the general desire to draw on the lower classes of society for artistic material. Only fifteen years after the publication of the first volume of the Rougon-Macquart series and twenty after the foundation of the Parnassian group, a host of new authors came to the front, and spared no efforts to shake off the yoke not merely of the poets of the time, but of Naturalism itself. Some of these men, though essentially poets, wrote at times in prose. They called themselves *Symbolistes,* or sometimes *Décadents,* which title, however, was originally a nickname. Instead of looking at things as the Realists had done, they declared that the world is essentially a subjective creation, and that therefore objects and thoughts are better represented and conveyed by means of symbols than by an accurate description. The true field for art is not reality, but the sphere of mobile, subtle sensations and feelings. Symbolism is individualism carried to its extreme limits. They adopted a special vocabulary and a special system of versification. The latter culminated in the *vers libre,* i.e. the verse where nothing but the artistic feeling of the poet decides as to rhythm, number of syllables, and rhyme. The Symbolists recognize as their leaders Paul Verlaine and Stéphane-Mallarmé, both of them former adherents of the Parnassian School; the best known are, besides the two already mentioned, Rimbaud, H. de Régnier, Viele-Griffin and Stuart Merrill (both American by birth), J. Laforgue, J. Moréas, G. Kahn, R. Ghil, Paul Fort. An important group has been flourishing in Belgium, Maeterlinck, Verhaeren, and Rodenbach being the chief members. In some prose authors, such as Huysmans (a former pupil of Zola), and the Sar Peladan, who has created the order of the Chevaliers de la Rose Croix, related tendencies have assumed the character of a vague artistic mysticism. These authors never succeeded in altogether gaining their point, the mass of the public being unable to follow them in such exoteric compositions. Therefore the next move has been a return to theories more accessible to the average mind. Groups of young poets, one in Toulouse, the other in Paris, have led the way in this new direction. They are known under the name of *Naturistes.* They speak highly of Zola, but while his attitude toward nature was purely scientific, they endeavor to bring out also its poetical aspects. There is nothing new in this vague pantheism itself, however original it may look after the extreme tendencies of Naturalism and Symbolism. Saint Georges de Bouhélier, M. Le Blond, and L. Balzagette are the principal Naturistes. Another group of seventeen authors has been formed still later; their ideals are the same as those of the school just mentioned, but they are more mature poets. Their first manifesto was issued in the fall of 1902. It is a collective publication: *Les Poètes de l'école française; la foi nouvelle.*

Thus the swing of the pendulum becomes quicker and shorter as sects and schools spring up and die away. In reality the twentieth century opens without any prevalent literary ideal; it cannot be said, however, that any kind of artistic manifestation is altogether lacking. The most representative Frenchmen at the close of the last century seem to be the novelist P. Loti, with his vague impressionism, and Renan and Anatole France, whose chief characteristics are a refined dilettantism and amiable skepticism.

History in the second half of the nineteenth century has assumed a more and more scientific form of treatment, with Fustel de Coulanges, Renan, Taine, Lavisse, Sorel, and it is considered by many, probably with reason, as belonging no longer to the domain of literature. The same question has even been raised with regard to criticism. Since the admirable work of Villemain, D. Nisard, and especially Sainte-Beuve, there has been a strong inclination toward scientific criticism. Taine, and with a kind of fanaticism Hennequin, systematized it to such an extent as to make it render well-nigh automatic judgments. The reaction was not long in setting in. The two methods in vogue in the last decade of the nineteenth century were that of the dogmatist, like Brunetière and Doumic, who judge works of literature according to their agreement with an objective canon, and that of the impressionists, like Lemaître and A. France, who allow themselves to be guided solely by their subjective feeling of the beautiful. Critics such as Faguet, Larroumet, Lanson, Pellissier, may be called intellectualists; they aim at impartiality, and support their opinions with rational motives. Among the rising stars in criticism in the first years of the twentieth century must be mentioned: C. Mauclair, A. Beaunier, for their openness to new ideas, and E. Charles for his energetic and independent criticism.

We ought to speak before ending of a deep but almost unconscious conflict, independent of any artistic standard, between two classes of authors —those who endeavor to make literature conform to the tastes of the masses, thus yielding to the democratic spirit of the nineteenth century, and those who try to resist these efforts. Authors like Hugo have been frequently accused of pandering to the popular taste. The great successes in this low order of literature have lain in the domain of the novel. Foremost in this style is Dumas, the elder, whose *Monte Cristo* and *Three Guardsmen* are familiar to all English readers. Next to him, though not so famous, are men like P. de Kock, E. Sue, A. Karr, Ponson-du-Terrail, Gaboriau, Richebourg, X. de Montépin, Saintine, Souvestre, O. Feuillet, and G. Ohnet.

On the stage a deliberate step toward popular art has been taken by M. Pottecher, who has created in 1895 his 'Théâtre du peuple' at Bussang, in the Vosges. He has found many imitators at Gérardmer, Ploujean, Béziers, and other towns of France. The advisability of establishing a similar institution in Paris has been discussed at length by the great French periodicals.

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FRENCHMAN'S BAY. An ocean inlet in Hancock County, Maine, extending inland about 25 miles, with a width in some places of 10 miles (Map: Maine, G 7). Mount Desert Island forms the western side of the bay, and Bar Harbor, the most prominent resort on this island, is situated on its shore. It furnishes numerous good harbors, and contains a number of islands, chief of which are the Porcupine, Iron Bound, Jordan, Stave, Calf, and Hancock islands.

FRENCH POLITICAL PARTIES. See Political Parties, section on France.

FRENCH PROPHETS. A name given in England to certain Camisards (q.v.), who came thither from France in 1706, making extravagant claims of prophecy, the gift of tongues, ability to work miracles, etc. They preached communistic doctrines and announced the speedy coming of the Messiah's kingdom. For a short time they gained converts, including some persons of influence. Consult David Hughson (i.e. Edward Pugh), *A Copious Account of the French and English Prophets* (London, 1814).

FRENCH PROTESTANT CHURCH. See Huguenots.

FRENCH REVOLUTION, The. The Revolution of 1879 in France which overthrew the Bourbon monarchy and the old feudal régime. In this article the name is employed for the period of French history beginning with the meeting of the States-General at Versailles, in 1789, and ending with the establishment of the Consulate, in 1799. For an account of the condition of France before the Revolution, and the causes that brought it about, see FRANCE.

When it was decided to summon the States-General, two important constitutional questions required solution—the distribution of representation among the three orders, and the method of voting in the States-General itself. Owing to the somewhat irregular character and procedure of this body, which had not met since 1614, there were no valid precedents which could be followed in 1789. In solution of the first question, a royal decree revived or created certain electoral divisions, and provided for the election of 250 delegations of four members each—one from the nobility, one from the clergy, and two from the Third Estate—thus dividing the membership of the States-General equally between the two upper orders and the Third Estate. Supplementary decrees provided for special cases which arose and considerably increased the number of members. In each electoral district, in conjunction with the election of the members of the States-General, each of the three orders drew up *cahiers,* or lists of grievances, including propositions for new legislation. The question of the method of voting was left unsolved, but the official expectation was that the vote would be by order, which would have required a majority vote of each of the orders to pass any measure. This would have been a bar to any vital measure of reform. The Third Estate, however, expected and intended to have a vote by head; that is, the three orders should vote as one body, and the simple majority should suffice to pass any measure. This would have placed the control in the hands of the Third Estate, which would vote as a unit, and could depend upon the support of a few liberal nobles and the considerable number of parish priests among the representatives of the clergy. When the States-General met, the nobility and the clergy organized as separate houses, but the Third Estate refused to take any such action, in spite of royal and ministerial pressure, and finally on June 17th declared themselves the National Assembly, and invited the nobility and clergy to take their own places in the Assembly. When the Third Estate first met on June 20th, they found their meeting-hall closed, but secured a place of meeting in the building called the Tennis Court (*jeu de paume*), where they took the famous oath not to dissolve until they had given France a constitution. They parish priests or *curés* and a few of the liberal nobles then joined the Third Estate. After the fruitless royal session of June 23d, in which the King commanded the three orders to meet separately, the remainder of the nobility and clergy, at the royal bidding, joined their fellows in the National Assembly, which came to be called the Constituent Assembly, because of its self-imposed task of framing a constitution. The leader of the Third Estate for the vote by head was Mirabeau (q.v.), an able but discredited noble who had secured an election as a representative of the Third Estate for Aix.

In July, under the influence of a few ultra-conservative and reactionary members of the royal family and of the nobility, the King assumed a hostile attitude, dismissed Necker, the Minister of Finance, in whom the hopes of a regenerated France largely centred, and concentrated troops on Paris. Insurrectionary movements, by which the masses of the people began to show their interest, broke out in Paris. Blood was shed in the capital on July 12th, and on the 14th the Bastille (q.v.), the visible sign of generations of tyranny, was stormed and partially destroyed. The propertied classes and the business people of the city, to prevent the recurrence of bloodshed and riot, and to maintain order, organized a city militia, called the National Guard, and a provisional city government. The King, in alarm, withdrew the troops, recalled Necker, and in response to popular demand visited Paris, where he legalized the provisional measures, and recognized Lafayette as Commandant General of the New National Guard, and the astronomer Bailly as Mayor of Paris, and changed the national colors from the white of the Bourbons to the new and popular tri-color.

Having failed in their attempt to overawe the National Assembly and the people of Paris, the Count of Artois, the King's youngest brother, and other leading reactionaries left France, being the first of the so-called Emigrés (q.v.). Immediately following the capture of the Bastille, local disturbances broke out in many sections of the country, while other parts were swept by a panic, known as the "Great Fear." The old administrative machine had broken down, and the nation was without an effective local government. In each locality the cool-headed lovers of law and order organized companies of the National Guard, and established a provisional local administration.

On the night of August 4th a report on the condition of the nation was read in the Constituent Assembly by one of the Deputies, Salomon. This report was followed by the abolition of the old feudal and manorial privileges. The Assembly did not begin at once the necessary constructive work, but dallied with academic discussion on the rights of man, a declaration of which was adopted, to be a preface to the new Constitution. (See ASSEMBLY, NATIONAL.) The King and his ministers failed to show any ability to deal with the crisis, while the attitude of the Queen and the Court gave color to rumors and popular fears concerning the hostile designs of the King against reforms. This period of suspense was ended by another outbreak in Paris. A mob, composed largely of hungry women, after some disturbances in the capital, marched to Versailles on October 5th, followed by Lafayette and the National Guard. Lafayette rescued the royal family, but did not disperse the mob, and on the following day the National Guard and the mob escorted the royal family to Paris and quartered them in the Tuileries. The Constituent Assembly soon followed and found a meeting-place near the Tuileries. Thus far, the Assembly had been dominated by admirers of the English Constitution, like Mounier and Mirabeau, and by admirers of America, like Lafayette and the Lameths. Although there were some theoretical admirers of republican institutions, still, in practice, all had contemplated a constitutional monarchy for France. Now, the most conservative members of the Assembly began to disappear, and slowly more liberal principles developed. A symptom of this change was in the organization of clubs, the earliest and most important of which was the Society of the Friends of the Constitution, later known as the Jacobins (q.v.), from the old monastery in which its meetings were held. The Jacobins became a great political force, because of their system of affiliated clubs in the provinces, with which they were in close communication. (See FEUILLANTS; JACOBINS.) Another important club in Paris was the Cordeliers (q.v.), under the radical leadership of Danton. Newspapers, as well as clubs, sprang into existence in 1789, for the censorship ceased to discharge its functions. These papers differed widely in form, regularity of issue, and character. In general their purpose was political and most of the space was occupied with accounts of the sessions of the Constituent Assembly. The most famous of the journals was the *Moniteur;* the most brilliant was the *Révolutions de France et de Brabant* of Camille Desmoulins, and the most erratic the *Ami du peuple* of Marat. On November 2d, the Assembly decreed the transfer of the property of the Church to the nation. In February, 1790, it abolished succession by primogeniture. In June, it suppressed all titles of nobility.

The work of drawing up the new Constitution went on apace in the Assembly, so that the first draft was accepted by the King on July 14th, 1790, the anniversary of the taking of the Bastille, at the Feast of the Federation in the Champ de Mars, in which representatives from all parts of the country participated. The Constitution gave the King a suspensive veto on all measures passed by the unicameral national legislature. The legislature shared with the King the control of foreign affairs. The most successful and most enduring portion of the new Constitution was the provision made for the reorganization of France into 83 departments, each with its local administration. All officials were to be elected by the people. Another feature of the new arrangements was equally important because of the opposition which it aroused. This was the Civil Constitution of the Clergy, which reorganized the Church upon the lines of the new civil administration and transferred the actual control of the Church from the hierarchy to the French State. The clergy were to be paid by the State and were required to take an oath to support the new arrangement. This caused a schism in the Church in France, because two-thirds of the priests remained loyal to the Catholic Church and refused to take the oath. The Assembly had already confiscated the estates of the Church and issued assignats (q.v.), or a kind of Government notes based upon these lands as security. The confiscated lands, comprising one-fifth of France, being thus placed suddenly upon the market, depreciated rapidly in value, and the assignats, owing to new issues, declined more rapidly. The only other important event of the summer of 1790 was the military mutiny at Nancy and its suppression by Bouillé (q.v.) on August 31st. Necker, to whom, of all the King's ministers, the nation had looked for wise and able measures, failed to accomplish anything, and retired from office in September, 1790, leaving the King without a single competent adviser. Mirabeau was the one man in public life who possessed real statesmanlike ability. Though viewed with suspicion by his colleagues in the Constituent Assembly, and with unconcealed contempt by the Queen and the Court, he attempted to place his talents at the service of the nation, through both the Assembly and the King. Though his advice was not accepted, the nation realized that his death, on April 2d, 1791, left France without a single statesman to guide her. Worst of all, France was not to be allowed to solve her problems alone. The Queen was in constant correspondence with her brother, the Emperor Leopold II., the ruler of the extensive Hapsburg dominions. This was regarded by the people as treasonable. Both Leopold and Frederick William II. of Prussia regarded the events in France with suspicion, and desired to save the French royal family from humiliation and possible danger. German rulers had allowed the increasing numbers of the émigrés to gather within their territories, and threaten armed invasion of France to rescue the royal family and restore the old order. Contrary to the advice which Mirabeau had given, the King and his family escaped from Paris on the night of June 20, 1791, and fled toward the eastern frontier to take refuge with the émigrés under the protection of the Emperor Leopold. This confirmed the popular suspicion that the Queen was in treasonable correspondence with her brother, and that the King had perjured himself in swearing to support the new Constitution. The King and the royal family were halted at Varennes and brought back to Paris.

The summer of 1791 witnessed two unfortunate events which foreshadowed the evil days to come. The first was the unprovoked firing upon a popular meeting in the Champ de Mars, in Paris, on July 17th—an event known as the Massacre of the Champ de Mars. The other was the meeting at Pillnitz of Leopold II. and Frederick William II. in August, and the issue of a joint declaration intended as a warning to the popular party in France. Meanwhile the Constituent Assembly had revised the Constitution on more conservative lines and submitted the completed work, the Constitution of 1791, to the King, who took the oath to it on September 14th. A new legislature having been chosen according to the provisions of the new Constitution, the Constituent Assembly dissolved on September 30, 1791.

The new legislature, known in history as the Legislative Assembly, began its sessions on October 1, 1791. The Assembly was composed of about 750 members, chosen largely from the middle class, and included no one who had sat in the Constituent Assembly. There were no organized parties in the Legislative Assembly; but two small groups, one liberal and one radical, early came into prominence—the Girondists (q.v.), so named because their leaders came from Bordeaux in the Department of the Gironde; and the Mountain, who took this name because they occupied the highest seats on the left side of the hall. The majority of the members of the Assembly were moderates or even conservatives, but the Girondists were generally able to carry their measures. Unfortunately, the Girondists were theorists and orators, and included among their number no person of statesman-like character. Under the leadership of Brissot they became a republican party, and monarchy gradually became unpopular. Differences in regard to the nature of the proposed republic later arose between the Girondists and the Mountain, the one desiring a federal republic like the United States, the other advocating a republic one and indivisible with a centralized administration. The Legislative Assembly enacted stringent measures against the émigrés and the priests who refused to take the oath to support the Civil Constitution of the Clergy. Failing to see that France needed peace in order to complete the solution of her internal questions and to establish a stable form of administration, the Girondists after prolonged discussions secured the passage, on April 20, 1792, of the fatal act declaring war against Prussia and Austria.

Lack of discipline was largely responsible for the failure of the French armies to keep the Austrians and Prussians out of France. The advance of the foreign armies increased the unrest in Paris. Small politicians began to form an organization to use the mob of Paris as a political force. On June 20th they directed a demonstration by the mob, which resulted accidentally in an invasion of the Tuileries. The knell of French monarchy had sounded. King, ministers, and legislators sat helpless awaiting the final blow, while the leaders of the mob quietly but without concealment matured their plans. They usurped the government of Paris, organizing a revolutionary commune. Volunteers were sent to the armies, while others were brought to Paris from Brest and Marseilles, the latter entering Paris singing the patriotic hymn henceforth known as the *Marseillaise.* On July 25th the Duke of Brunswick, who commanded the Austro-Prussian Army which was preparing to invade France, issued a proclamation against the French Revolutionists which aroused the Parisians to frenzy. On August 10th all was ready and the revolutionary leaders struck their blow. The Tuileries was stormed and the Swiss Guard was massacred. The royal family took refuge in the hall of the Legislative Assembly, which suspended the King and placed the royal family under strict surveillance in the Temple. A national convention to revise the Constitution was called, to be elected not on the restricted franchise provided in the Constitution of 1791, but by universal manhood suffrage. Numerous suspects were arrested, and Danton as Minister of Justice acted virtually as dictator. Lafayette in alarm abandoned his army and fled from France, but was seized and imprisoned by the Austrians. Further losses on the frontier resulted in further disturbances in Paris, culminating in the massacres of September, during which about 1000 royalists and nonjuring priests in the prisons were slain by the mob. Popular outbreaks also took place in some of the provincial cities. The tide of disaster and disorder was stemmed by the news of the engagement of Valmy on September 20th, between Kellerman and the Duke of Brunswick who vainly cannonaded the French position. On the same day the Legislative Assembly ended its sessions.

The National Convention, composed of about 750 members, nearly 500 of whom were new men, met on September 21st, and promptly showed its character by abolishing the monarchy and declaring France a republic. The first weeks of the Convention were marked by the occupation of Savoy and Nice, the successes of the French armies on the Rhine, and the victory of Dumouriez over the Austrians at Jemappes (November 6). In December the King was brought to trial, and called upon to answer for alleged acts of treason against the nation. Sentence of death was passed upon him, and on January 21, 1793, he was beheaded. The division of parties, which had been noticeable to some extent in the Legislative Assembly, became marked in the Convention. The Girondists in the beginning possessed a decided majority, but as the party of moderation they showed themselves less able to cope with the many dangers that beset revolutionary France than the thorough-going members of the Mountain. As the representatives, too, of the higher bourgeoisie they were destined to fall before the fierce champions of democracy. The downfall of the Girondist influence began with the trial of Louis XVI., when, against their will, they were compelled to vote to sentence the King to death.

On the frontiers, the year 1793 opened with a series of disasters, which emphasized the folly of the declaration on February 1st of war against Great Britain, the Protestant Netherlands and Spain. Successive defeats were reflected at Paris in successive measures of a vigorous and revolutionary character. Early in March eighty-two members of the Convention were dispatched to the different departments to raise 300,000 troops, and at Paris a Revolutionary Tribunal was established for the speedy trial of persons deemed guilty of crimes against the nation. The defeat of Dumouriez (q.v.) at Neerwinden on March 18th, and the desertion of that general to the Austrians, were followed in April by the establishment of an executive committee of the Convention, the first Committee of Public Safety, which under the leadership of Danton wielded dictatorial powers of government. Civil war was already developing in France because of the resistance of the Catholic and royalist peasants of the Vendée and neighboring departments in Western France to the levy of the 300,000 troops. Up to this time, April, 1793, the Girondists had shared responsibility for every measure of a revolutionary character and had themselves created the instruments of their own overthrow and destruction. But ever since the early weeks of the Convention the Girondists and the Mountain had been engaged in a life and death struggle, whose end was hastened by the terrible dangers which beset France. Hostile armies had crossed the frontier and were pressing toward Paris. Within was civil war. In the words of Danton, audacious measures were necessary. Danton and the Mountain were prepared to take them. The Girondists wanted to debate when delay was treason. The Girondists were overthrown on June 2d, and their leaders expelled from the Convention and placed in custody. The revolutionary commune of Paris, which contained the most radical individuals in power during the Reign of Terror, was placed on a legal footing. In the meanwhile the Deputies on mission were working with patriotic ardor in the provinces, and thirteen armies were organized, equipped, and maintained in the field to serve against foes abroad and at home. A democratic constitution, the Constitution of 1793, was speedily drawn up and promulgated, but it never went into actual force. The Committee of Public Safety ruled France from July, 1793, to July, 1794. In conjunction with the Committee of General Security in charge of the police administration, it saved France, though at the expense of the Reign of Terror.

The Great Committee of Public Safety apportioned its work to the different members. Carnot and Prieur of the Côte d'Or dealt with the questions of military strategy and the supply of arms and ordnance; Lindet and Prieur of the Marne had charge of the provisioning of the cities and the armies; Jeanbon Saint-André looked after the navy; Billaud-Varenne and Collot d'Herbois were charged with the internal administration and were the real managers of the Terror; Barère and Saint-Just were the spokesmen of the Committee in the Convention; while Robespierre, as the only member with a reputation, did little work, but was a figurehead who received all the glory and later all the blame for the acts of the Committee as a whole. The services of Robespierre, though not very material, were none the less real, because, hiding behind his great personality, the workers were able, unquestioned and unhampered, to save France. The Great Committee carried out the internal administration by sending out members of the Convention as deputies on mission to the different departments to control and direct the revolutionary authorities established in each locality. Bluster, terror, imprisonment, and a few executions kept most of the departments in order. War and measures of a harsher character were employed against the royalist and Catholic uprisings in the Vendée and Brittany, and against the Girondist insurgents in Caen, Lyons, Marseilles, Toulon, and Bordeaux. Popular indignaton against the Girondists became more bitter after the assassination of Marat (July 13th) by Charlotte Corday, at the instigation, it was thought, of the Girondists at Caen. By the end of 1793 the Girondist rising had all been suppressed and the leaders, including twenty-one deputies to the Convention, executed. The Vendeans were completely defeated, but continued to carry on a guerrilla warfare until 1800. Nantes, the largest city in the Vendean country, was the headquarters of the infamous deputy on mission Carrier (q.v.), who executed more victims than did his colleagues in all the rest of France. At Paris, Fouquier-Tinville (q.v.) and the Revolutionary Tribunal sent about twenty-six hundred persons to the guillotine, including nearly all of the notable victims of the Revolution from Queen Marie Antoinette down to the unsuccessful generals and the non-juring priests. It is worthy of notice that the number of victims during the Reign of Terror has been greatly overestimated, and that more Frenchmen perished in single battles under Napoleon. The greatest sufferer during the Terror was the Catholic Church, which had to expiate its abuses during the Ancien Régime, and to suffer for its refusal to accept the Civil Constitution of the Clergy. The opposition to the Church culminated in the spasmodic establishment of the Worship of Reason, marked by the Festival in Nôtre-Dame at Paris on November 10, 1793. Danton and Robespierre recoiled from such desecration, and the Worship of Reason gradually died out. Later Robespierre tried to establish the Worship of the Supreme Being, and inaugurated the new cult by the Festival of the Supreme Being on June 8, 1794. With the introduction of the Revolutionary Calendar in October, 1793, weeks were replaced by decades, and the observance of the Christian Sabbath and of saints' day instead of the *decadi,* and the revolutionary festivals became a criminal offense. These revolutionary festivals were celebrated in Paris with great pageants under the direction of the painter David. The measures of the Government of the Terror were not alone destructive and revolutionary, such as the Law of the Suspects and the Law of the Maximum, establishing fixed prices for commodities and wages, but included much of a constructive nature. The bases of the civil and criminal codes were the work of the committees of the Convention. Another committee devised the system of national education, afterwards slightly modified and established by Napoleon. The military committee under Dubois-Crancé effected the reorganization of the army. The metric system and the French decimal currency were among the other creations of the Convention.

The suppression of civil war and the establishment of internal order permitted the use of all the nation's resources against the foreign foe, and a succession of victories planned by Carnot and made possible by the labors of his colleagues soon began to reward the efforts of the Great Committee of Public Safety. Beginning with the successes of Jourdan at Wattignies (October 16, 1793), and of Pichegru at Weissenburg in December, the invaders were driven out of France, and the French armies were able in the spring of 1794 to take the offensive. The series of victories was crowned by Jourdan in the capture of Charleroi and the defeat of the Austrians at Fleurus (June 26, 1794). Thus not only at home, but also against the foreign foe, the Government of the Terror had justified itself.

The Revolution, however, was destined, Saturn-like, to devour its offspring. Robespierre and the Great Committee of Public Safety felt that the circumstances compelled them not only to crush insurrection and revolt, but also to silence any questioning of their policies and acts. On the one hand, Hébert, Chaumette, and the other leaders of the Commune of Paris were more radical than the Great Committee, and incurred the dislike of Robespierre, because of their devotion to the Worship of Reason, and because of the indecent character of the *Père Duchesne,* a series of political tracts published by Hébert. On the other hand, the Great Committee and Robespierre feared Danton, who had begun to suggest that the Terror had gone far enough. Robespierre and the Committee acted with promptness and vigor. The Hébertists were executed on March 24, 1794, and the Dantonists on April 5th. After the death of Danton, Robespierre seemed to be supreme, and at his bidding the Revolutionary Tribunal worked more speedily, and sent daily to the guillotine almost as many victims as it had previously done in a week. The Terror was at its height, but the fullness of time had come. The victory at Fleurus rendered further terroristic measures unnecessary. Furthermore, foes of Robespierre began to see that they stood in the way of the coming of his expected reign of peace and virtue, and so were troubled for their own safety. Among these were even members of the Great Committee, who conceived the idea of making Robespierre the scapegoat for their deeds. The plot was laid, and on July 27th the blow fell. Robespierre and his two friends in the Great Committee, Couthon and Saint-Just, and others of his followers were ordered under arrest and executed on July 28th and the following days. This was the Revolution of the Ninth of Thermidor and the end of the Reign of Terror.

The remaining fifteen months of the Convention were a period of reaction. The Committee of Public Safety, with a changing membership, continued to direct the administration; but the Revolutionary Tribunal was dissolved, the Law of the Maximum was repealed, the deputies ceased to go on mission, and the Jacobin Club, which had been so closely identified with the Terror, was closed. Girondists and Conservatives who had withdrawn from the Convention or had been expelled were recalled. Until the close of 1794 the Convention and the Committee of Public Safety were controlled by the Thermidorians, the men who had overthrown Robespierre. During the winter of 1794-95 they were superseded by the returning Conservatives and Girondists, who devoted the last months of the Convention to an attempt to obtain revenge for their sufferings during the Terror. On April 1, 1795 (12 Germinal), and on May 20 (1 Prairial) bread riots broke out in Paris and the insurgents clamored for a restoration of the "red republicanism" of 1793. Both insurrections were crushed; the great Terrorists, like Billaud-Varenne and Collot d'Herbois, were deported, and the survivors of the Mountain imprisoned, deported, or executed. This reaction, known as the White Terror, extended to the provinces, especially to Southern France, where the vengeance wreaked upon the Mountain was more bloody than the Terror itself. In the summer of 1795 the Convention performed the task for which it had been elected in the summer of 1792, and drew up a new constitution called the Constitution of the Year III. The closing months of the Convention were marked by an unbroken series of military successes, and by the first efforts toward the restoration of peace. The United Provinces were occupied by Pichegru and organized as the Batavian Republic under French protection; and the French Minister in Switzerland signed at Basel treaties of peace with Tuscany, Prussia (April 5, 1795), Saxony, Hanover, Hesse-Cassel, and Spain (July). France remained at war with Sardinia, England, Austria, and the Empire.

The Convention was not to close without one more insurrection in Paris—that of the 13th Vendémiaire (October 5, 1795), in opposition to the new Constitution. This rising was quelled by Barras with the aid of Napoleon Bonaparte. The Convention came to an end on October 26, 1795, and was replaced by the Directory, the Government established by the Constitution of the Year III. The executive authority was vested in a committee of five Directors, and the legislative power was exercised by two houses, the Council of the Ancients and the Council of Five Hundred. By order of the Convention the first Directors and two-thirds of the first Legislature were to be chosen from the members of the Convention. One member of the Directory and one-third of the Legislature were to retire annually, beginning in May, 1797. The new Constitution had one fatal fault; it made inevitable a deadlock between the Executive and the Legislature, and provided no means of breaking it except by revolution. Such a deadlock occurred after the elections of 1797, and was met by three of the Directors, Barras, Larévellière-Lépeaux and Reubell, who, by the coup d'état of 18 Fructidor (September 4), expelled their colleagues, Carnot and Barthélemy, and a large number of the members of the two Councils, thus preventing the triumph of the party of reaction which had won in the elections. The reverse happened in the coup d'état of 30 Prairial (June 18, 1799), when the Councils asserted themselves and seized control of the Executive, under the leadership of Sieyès. The Directors were assisted in the conduct of the central Government by a Ministry, which at one time or another included such able men as Talleyrand, Fouché, and Merlin of Douai. The local administration was conducted in an arbitrary manner by national agents appointed by the central Government. The Government was corrupt, and the reckless management of the finances would have ruined the nation had its coffers not been enriched by the plunder of Italy, sent home by Bonaparte. The measures against the émigrés and the non-juring priests lost little of their harshness. Though the worship of Reason had been forgotten, the attempt to give France civil religion continued, and new religions, like 'Theophilanthropy,' were devised and became the fad of the moment. Society, under the influence of the brilliant and dissolute Barras, the most important of the Directors, was corrupt, irreligious, and dissolute. In short, little of importance and nothing of credit marked the internal history of the Directory, and only by the success of its military policy did it justify its existence. In Italy Bonaparte crushed Sardinia and forced her to accept peace, and in a series of campaigns of unsurpassed brilliancy drove the Austrians out of Italy, marched on Vienna, and forced the Emperor, Francis II., to sue for peace, which was concluded at Campo Formio, October 17, 1797. In Southern Germany, Hoche and Moreau had conducted equally glorious but less successful campaigns against the Austrians. Bonaparte refused to invade England, the one remaining enemy of France, and was encouraged by the Directors who feared him in carrying out his scheme of conquering Egypt as a step towards destroying England's power in India. In spite of his victories the campaign was a failure. The English fleet under Nelson destroyed the French fleet in the battle of the Nile (August 1-2, 1798), and held control of the Mediterranean. Meanwhile, freed from the fear of Bonaparte, the enemies of France once more assumed the offensive. Austria broke the Treaty of Campo Formio, and, in alliance with England and Russia, renewed the war. The combined Austrian and Russian armies, by the victories of Suvaroff at the Trebbia (June 17-19, 1799), and at Novi (August 15, 1799), drove the French into Genoa. The reverses of the French arms and the evil internal conditions caused discerning men like Sieyès, Fouché, and Talleyrand to turn to Bonaparte as the possible savior of France. In response to their invitations he returned from Egypt, and by the coup d'état of 18 Brumaire (November 9, 1799) overthrew the Directory and the Councils, and established a Provisional Government, consisting of himself, Sieyès, and Roger Ducos as Consuls. A new constitution, the Constitution of the year VIII., was drawn up, establishing the Consulate, with Bonaparte as First Consul; Cambacérès, Second Consul; and Lebrun, Third Consul. A Tribunate was to debate proposed laws, which were to be voted upon without debate by the Corps Législatif. Practically, the First Consul was dictator, with absolute powers.

Primary Authorities. The files of newspapers, such as the *Moniteur;* the memoirs of contemporaries, such as those collected by Berville, Barrière, and Lescure; volumes in the *Collection des documents inédits sur l'histoire de France,* such as Aulard, *Recueil des actes du comité de salut public;* Brette, *Recueil des actes rélatifs à la convocation des Etats généraux de 1789;* and

Guillaume, *Procès-verbaux du comité d'instruction publique;* the volumes of the *Collection des documents rélatifs à l'histoire de Paris pendant la révolution française*—, such as Aulard, *La société des Jacobins,* the publications of the *Société d'histoire de la Révolution française,* and the *Société d'histoire contemporaine;* the legislative proceedings as given in Buchez and Roux, *Histoire parlementaire,* and Mavidal and Laurent, *Archives parlementaires;* and numerous other publications, such as Kaulek, *Papiers de Barthélemy,* may be mentioned as the most accessible and useful. Special bibliographies on the French Revolution are: Tourneux, *Bibliographie de l'histoire de Paris pendant le Révolution française,* and a portion of the *Catalogue de l'histoire de France à la bibliotheque nationale.* The best short accounts are: Mignet, *Histoire de la Révolution française* (1st ed., Paris, 1824); Rose, *Revolutionary and Napoleonic Era* (New York, 1897); Morse-Stephens, *Europe, 1789-1815* (New York, 1893). The best product of modern scholarship is Aulard, *Histoire politique de la Révolution française, 1789-1804* (Paris, 1901); the best in English, though at present ending at 1793, is Morse-Stephens, *History of the French Revolution* (2 vols., New York, 1886-91). Of the more famous works, Carlyle, *French Revolution* (1st ed. London, 1837), is a literary appreciation; Thiers, *Histoire de la Révolution française* (1st ed. Paris, 1823-27), is now useful only for the Directory; Quinet, *La Révolution* (1st ed. Paris, 1885), and Taine, *La Révolution* (1st ed. Paris, 1878-85), are philosophical and psychological rather than historical studies; Michelet, *Histoire de la Révolution française* (1st ed. Paris, 1847-53), is the most brilliant literary history in French. There are English translations of Mignet, Thiers, Michelet and Taine. Though differing widely in method, bias, and value, the most useful special works are, for international relations: Sybel, *Geschichte der Revolutionszeit von 1789 bis 1800* (5 vols., Düsseldorf, 1853-74; English translation to 1795, London, 1867-69); Bourgoing, *Histoire diplomatique de l'Europe pendant la Révolution française* (3 vols., Paris, 1865-71); Sorel, *L'Europe et la Révolution française* (4 vols., Paris, 1885-92); for military affairs: Jomini, *Histoire critique et militaire des campagnes de la Révolution de 1792 à 1801* (3d ed., 15 vols., and 4 atlases, Paris, 1819-24); Chuquet, *Les guerres de la Révolution* (11 vols., Paris, 1886-1895); Iung, *L'Armée et la Révolution: Dubois-Crancé* (2 vols., Paris, 1884), and *Bonaparte et son temps, 1769-1799* (3 vols., Paris, 1880-85); for naval affairs: Mahan, *Influence of Sea Power upon the French Revolution and Empire, 1793-1812* (2 vols., Boston, 1892); Chevalier, *Histoire de la marine française sous la première république* (Paris, 1886); for the Emigrés: Forneron, *Histoire générale des émigrés pendant la Révolution française* (3d ed., 2 vols., Paris, 1884); for internal affairs: Aulard, *L'éloquence parlementaire pendant la Révolution française* (3 vols., Paris, 1882-86); Mortimer-Ternaux, *Histoire de la Terreur* (8 vols. Paris, 1862-81); Wallon, *Histoire du tribunal révolutionnaire de Paris* (6 vols., Paris, 1880-82), *La Révolution du 31 mai et le fédéralisme en 1793* (2 vols. Paris, 1886), and *Les représentants du peuple en mission et la justice révolutionnaire dans les départements en l'an 2* (5 vols., Paris, 1889-90); Sciout, *Le Directoire* (2 vols., Paris, 1895, in publication); for the finances: Stourm, *Les finances de l'ancien régime et la révolution* (2 vols., Paris, 1885); for religious affairs: Sciout, *Histoire de la constitution civile du clergé* (4 vols. Paris, 1872-81); Aulard, *Le culte de la raison et le culte de l'Etre suprême* (Paris, 1892); for society: Goncourt, *Histoire de la société française pendant la Révolution* (Paris, 1854), and *Histoire de la société française pendant le Directoire* (Paris, 1855); for the Vendean War: Chassin, *La préparation de la guerre de Vendée* (3 vols., Paris, 1892), *La Vendée patriote* (4 vols., Paris, 1893-95), and *Les pacifications de l'Ouest* (3 vols., Paris, 1898-99).

FRENCH RIVER. A stream in Ontario, Can., emptying Lake Nipissing into the Georgian Bay of Lake Huron, after a course of 55 miles (Map: Ontario, C 2). It is noted for its magnificent scenery, and for 150 years was the regular route to the Upper Lakes.

FRENCH RYE GRASS. See ARRHENATHERUM.

FRENCH SETTLEMENTS. The French colonies of Pondicherry, Chandernagar, Karikal, Mahé, and Yanoan (qq.v.) in India.

FRENCH SHORE. See NEWFOUNDLAND.

FRENCH SOMALILAND, sō-mä′lē-lănd. A possession of France in Northeast Africa, on the west shore of the Gulf of Aden; bounded on the northwest by Eritrea, on the west and southwest by Abyssinia, and on the southeast by the British Somaliland Protectorate (Map: Africa, J 3). The area of the French Somali Protectorate proper is almost 5000 square miles; with the dependencies, the area is estimated at 45,000 square miles. The coast is generally hilly. The interior is practically a plateau, with an average elevation of about 4000 feet, and sloping from northwest to southeast. Almost without industries of any kind, the country has, however, a trade of some importance, owing to the sea fisheries and the traffic with the interior of the continent. In 1900 the imports reached a value of $1,200,000, an increase of $400,000 over 1899. The value of the exports is given at $450,000 in 1899 and $140,000 in 1900. Among the imports are cotton and silk goods, foodstuffs, and tobacco; among the exports are coffee, ivory, gold, and sheepskins. Most of the direct trade is with France. The Jibutil-Harar Railway has 100 miles open for traffic, and will bring a greatly increased trade from Abyssinia. The ports are in close communication with Aden by local boats. French and English vessels visit the coast regularly.

The country is, since 1899, administered by a Governor and by a General Council of six members, three chosen from Government officials, and three from the leading residents. In 1902 the French budget for the Somali coast was $40,000. In 1900 the local budget was $120,000. The population of the protectorate proper is about 22,000; with the dependencies added the population is estimated at 200,000. The natives belong to the Danakil and Galla races. The principal towns are Jiboutil, a port since 1888, and now the seat of the colonial administration; Obok, with 15,000 inhabitants (2500 European), a port with post-office and telegraph; Tajurah, with 2000 people; and Ambado, Gobad, and Sagallo. Obok has been in possession of the French since 1855. In 1881 they began active operations in this region. They acquired Sagallo in 1883; Tajurah in 1884; and Ambado in 1888, in which year a port was created at Jibutil. In 1887 and 1891 the boundaries of the country were definitely fixed with England and with Italy, and in 1896 with Abyssinia on the west.

FRENCH SPOLIATION CLAIMS. Demands made upon the United States Government by American merchants for losses of ships and cargoes between 1793 and 1800 at the hands of the French, whose chief excuse for the depredations was that the United States had violated its pledges under the treaty of 1778. By the treaty of September 30, 1800, and by the convention of April 30, 1803, France released the United States from certain treaty obligations, and in return was released from paying the merchants' claims, the United States securing peace at the expense of her citizens. Between 1800 and 1885 some fifty bills to reimburse the claimants or their descendants came before Congress, and appropriations were twice voted, but were vetoed in each case by Presidents Polk and Pierce respectively. No redress was obtained until 1885, when the adjudication of the claims was given to the Court of Claims, and decisions were reached awarding some $4,800,000 to the petitioners.

FRENCH SUDAN, sōō′dän′. A name formerly used to designate the territory in Western Africa extending from about 12° W. longitude to Lake Chad, and from the Sahara on the north to the northern boundaries of the countries along the northern coast of the Gulf of Guinea (Map: Africa, D 3). French Sudan was divided up by a decree in 1899. The western portions of it fell to Senegal, French Guinea, the Ivory Coast, and Dahomey, and the rest was formed into the three military territories of French Sudan, all the foregoing possessions being under the administration of the Governor-General of French West Africa (q.v.).

FRENCHTOWN. A township in Monroe County, Mich., about 22 miles southwest of Detroit, formerly the name of a village on the site of the present Monroe. Here on January 14, 1813, during the second war between the United States and Great Britain, an American force of about 650, under Colonel Lewis, defeated a force of about 100 British, under Major Reynolds, and of about 400 Indians, under Round-Head and Walk-in-the-Water, the American loss being 12 killed and 55 wounded, and the British and Indian loss, though not definitely known, probably being considerably larger. On the 20th Colonel Lewis was joined by General Winchester with about 250 men, and on the 22d the combined force was defeated by a force of about 500 British, under Colonel Proctor, and about 600 Indians, under Round-Head and Walk-in-the-Water. In accordance with the orders of General Winchester, who had been captured by the Indians, Major Madison surrendered his troops as prisoners of war, on condition that protection be afforded by Proctor against the Indians. The prisoners who were able to march were taken by Proctor to Malden, Canada, and the wounded were left in the charge of an insufficient guard commanded by Major Reynolds at Frenchtown. On the 23d the wounded were massacred by the Indians, in what is known as the 'Massacre of the River Raisin.' Of the total American force 397 were killed or were missing, 537 were captured, and only 33 escaped. The British lost about 24 killed and 158 wounded; while the Indian loss, though doubtless very large, was never accurately determined. Throughout the rest of the war 'Remember the River Raisin' was used as a battle-cry by the frontiersmen. Consult Dawson, *Battles of the United States* (New York, 1858).

FRENCH VERSION. See BIBLE.

FRENCH WEST AFRICA. A governor-generalship of France, comprising, in accordance with the decree of October 17, 1899, practically all of the Sahara; Senegal, including the western part of what had been known as French Sudan, which part was annexed to Senegal in 1899; the three military territories of French Sudan; and French Guinea, the Ivory Coast, and South Dahomey (Map: Africa, D 3). The Governor-General of French West Africa resides at Saint-Louis, Senegal, and besides exercising general authority over all the above-mentioned French possessions, acts as Governor of Senegal.

FREND, WILLIAM (1757-1841). An English reformer. He was born at Canterbury; was educated at Saint-Omer, France, and, after a few weeks spent in business in Quebec, went to Christ's College, Cambridge, where he studied for orders and took high honors. In 1781 he was chosen fellow. Two years afterwards he was appointed rector at Madingley, near Cambridge. In 1787 he became a Unitarian; tried to convert the surrounding country by an *Address to the Inhabitants of Cambridge . . . to turn from the false Worship of Three Persons to the Worship of the One True God* (1788), and did his best to do away with obligatory subscription to the Thirty-Nine Articles as a preliminary to the master's degree. For this heresy he was removed from his office of tutor. Five years later, after travels abroad, he wrote a radical pamphlet, *Peace and Union Recommended to the Associated Bodies of Republicans and Anti-Republicans.* The vice-chancellor and heads of the colleges tried him and found him guilty of breaking the statute *De Concionibus.* He was banished from the university, but continued to hold his fellowship until he was married (1808). In 1806 he went to London and was long connected with the Rock Life Assurance Company. He wrote *Principles of Algebra* (1796-99). His pamphlets, besides those mentioned above, were: *Thoughts on Religious Tests* (1789); *An Account of the Proceedings in the University of Cambridge Against William Frend* (1793); *Scarcity of Bread* (1795); *A Letter to the Vice-Chancellor of Cambridge* (1798); *Principles of Taxation* (1799); *The Effect of Paper Money on the Price of Provisions* (1801); *A Letter on the Slave Trade* (1817).

FRENEAU, fre-nō′, PHILIP (1752-1832). An American poet, a graduate of Princeton (1771), where he was a college mate of James Madison and H. H. Brackenridge (q.v.). He wrote with the latter for the college commencement a poem on "The Rising Glory of America." He had begun writing verses early, and did much ephemeral work immediately after graduating. After teaching school for a time he studied law and made his first essay in journalism in Philadelphia. In 1776 he made a voyage to the Danish West Indies, serving as mate and acquiring nautical experience. On his return to the United States he did some editing with Brackenridge, then took out letters of marque and made a voyage in a privateer which he had built (1780). He was captured by the English, and recorded his experiences on a prison ship at New York in a prose narrative and in a strong poem in four cantos, "The British Prison Ship." He regained his liberty in July, 1780, wrote much in prose and satiric verse in periodicals, collected his poems (1786), and occupied himself as shipmaster and journalist till 1791, when Jefferson made him translator for the State Department, and induced him to take charge of the violently anti-Federalist *National Gazette.* Two years later Freneau retired to his home at Mount Pleasant, N. J., and edited the *Jersey Chronicle* for a year. Then he tried journalism in New York, but soon abandoned it for the sea. He made several voyages, one as far as Calcutta, but retired in 1809 in consequence of the laws restricting navigation. After this his life was uneventful. When nearly eighty-one he was found dead in a marsh, having lost his way in the snow while returning home from an entertainment. Editions of Freneau's poems (which are hard to obtain) were published during his life in 1786, 1788 (containing some prose), 1795, 1809, and 1815. The last was filled with panegyrics on the soldiers and sailors of the War of 1812. The edition of 1786 was reprinted in London and New York, 1861 and 1865. Freneau was the first genuine American poet of marked ability. Though his poetry is largely satirical, the most permanent is found in the beautiful lyrics, such as "The Indian Burying-Ground," "The Wild Honeysuckle," and "Eutaw Springs." His verses show a distinct love of nature, and prove him to have been a man of considerable culture, although in the main they follow conventional eighteenth-century models. He published a few volumes of prose under the pen-name of "Robert Slender," which have received and deserve little attention. Consult: The biography by Mary Austin (New York, 1901); Tyler, *Literary History of the American Revolution* (New York, 1897); and Wendell, *Literary History of America* (New York, 1900). A complete edition of Freneau's poems is being prepared by F. L. Pattee (1902).

FRENTA′NI. A people in Central Italy in the early ages, descended from the Samnites, but allies of Rome. They dwelt in a hilly region on the shores of the Adriatic Sea, and their chief town was Histonium.

FRENZEL, frĕnts′el, Karl Wilhelm (1827—). A German journalist and novelist, born and educated in Berlin. In 1861 he became associated with the *National-Zeitung* of Berlin in the capacity of dramatic and literary critic. His works include many historical novels depicting French life during the eighteenth century. Several of these are well known, such as *Charlotte Corday* (1864); *Watteau* (1864); *La Pucelle* (1871); and *Lucifer, ein Roman aus der Napoleonischen Zeit* (1873). His *Berliner Dramaturgie* (reprinted 1882) is a valuable and interesting contribution to the history of the modern drama at the German capital.

FREPPEL, fre-pĕl′, Charles Emile (1827-91). A French prelate and ecclesiastical historian. He was born at Obernai, Lower Alsace, and studied at the Theological Seminary, Strassburg, and was ordained in 1849. In 1854 he was appointed professor of church oratory at the University of Paris, in 1862 he became preacher at the Tuileries, and in 1870 he was appointed Bishop of Angers. He was a champion of the doctrine of the infallibility of the Pope, which doctrine he defended before the Ecumenical Council at the Vatican. After the Franco-German War he publicly counseled the restoration of the monarchy, and on numerous occasions, more particularly during the controversy between Bismarck and the Vatican, he revealed his anti-German tendencies. The Catholic University at Angers was founded by him in 1875. Several of his numerous works on Church history and kindred subjects have become extremely popular. These include: *Les pères apostoliques et leur époque* (3d ed. 1870); *Les apologistes chrétiens au IIe siècle* (3d ed. 1886); *Examen critique de la vie de Jésus-Christ par M. Renan* (15th ed. 1866), a violent polemic directed against the well-known work by Renan. His complete works were published in 10 volumes (1880-88).

FRÈRE, frâr. A family of French painters. Charles Théodore (1815-88), the elder, genre and landscape painter, was born in Paris. He was a pupil of Cogniet and Roquelan, and made his first exhibit in 1834. Two years later he went to Algeria, traversed the desert, visited the East, and was present at the fall of Constantine, in October, 1837. In 1869 he accompanied the Empress Eugénie in her voyage up the Nile, making a sketch-book of aquarelles at her request. His favorite subjects for pictures were scenes from Eastern life, but he occasionally produced military pieces. Small in size, his paintings are rich in color, accurate in design, and harmonious in execution. Among the best of them are a series of scenes in Constantine (1840-48), a "Bazaar in Damascus," a "Harem in Cairo," "Festival in Constantinople," "Ruins of Karnak," "Caravan of Mecca." He twice received the medal—in 1848 and in 1865. He died in Paris, March 25, 1888.—Pierre Edouard (1819-86). A genre painter, brother of the preceding. He was born in Paris, January 10, 1819, and studied under Paul Delaroche and in the Ecole des Beaux-Arts. He exhibited his first picture in the Salon of 1843, and received two third-class medals—in 1850 and 1855—and a second-class medal in 1852. At the close of the Exposition of 1855 he was decorated with the cross of the Legion of Honor. He was one of the most sane and wholesome of French genre painters, and his portrayal of humble household scenes and child life are marked by true sentiment. He possessed also a fine sense of color. His pictures are well known through reproductions. Among the best are the "Little Gourmand," "Curiosity," "Repose," "The Little Cook," "First Steps," "The Library," "Going to School." Frère died at Anvers-sur-Oise, June, 1886.—Charles Edouard (1837—). A genre, landscape, and portrait painter, son and pupil of Théodore. He received a second-class medal in 1848, and a first-class medal in 1865. Among his paintings are the "Muleteer in the Alps" (1865), "The Basket-Sellers," "Before the Rain" (1875), "The Surgical Operation" (1884).

FRERE, frĕr, Sir Henry Bartle Edward, familiarly known as Sir Bartle Frere (1815-84). A British diplomat and administrator. He was born at Clydach, Brecknockshire, March 29, 1815, and after education at Bath Grammar School went to Haileybury College to prepare for the Indian Civil Service, which he entered in 1834, and in

1835 received an appointment at Poona. His judicious treatment of native agriculturists led to beneficial results and to his advancement. In 1842 he became secretary to Sir George Arthur, Governor of Bombay; in 1856 proceeded to Sindh as British resident; and in 1860 was appointed chief commissioner. In 1859 he was created K.C.B. in recognition of valuable services during the Indian mutiny, for which he twice received the thanks of Parliament. From 1862-67 he was Governor of Bombay. On his return to England he was knighted and nominated member of the Indian Council in London. In 1872 he went as special commissioner to East Africa, and induced the Sultan of Zanzibar to sign a treaty abolishing the slave trade. In 1875 he was chosen to accompany the Prince of Wales to Egypt and India. He was Governor of Cape Colony 1877-80, and as High Commissioner for British South Africa was deputed to arrange the confederation of the South African colonies, which was frustrated by the Kaffir and Zulu wars and trouble with the Boers. He was recalled and lived in retirement at Wimbledon until his death, March 29, 1884. He was several times president of the Royal Asiatic Society, and in 1872 was elected president of the Royal Geographical Society. His writings, consisting of letters, speeches, etc., include a *Memoir of the Right Hon. John Hookham Frere,* prefixed to the latter's works (1871-74); *Pandurang Hari, or Memoir of a Hindoo;* and *Eastern Africa as a Field for Christian Labor* (1874). Consult Martineau, *Life and Correspondence of Sir Bartle Frere* (London, 1895).

FRERE, John Hookham (1769-1846). An English diplomat and author. He was born in London, and in 1785 went from a Putney preparatory school to Eton. He proceeded to Caius College, Cambridge; graduated B.A., 1792; M.A. in 1795, and was elected a fellow. He entered the Foreign Office under Lord Grenville and from 1796-1802 represented Looe, Cornwall, in Parliament. As a contributor to the *Anti-Jacobin* he supported Canning's defense of Pitt's Administration, and in 1799 was made Under-Secretary of State. He was appointed Envoy to Lisbon in 1800, and twice went as Minister to Spain in 1802 and 1808. His counsel, resulting in Sir John Moore's disastrous retreat to Corunna, caused his recall. He afterwards refused an ambassadorship at Saint Petersburg, and twice declined a peerage. Owing to his wife's ill health, he retired to Malta, and devoted himself to literature and languages. His mock-heroic poem, *Prospectus and Specimen of an intended National Work by William and Robert Whistlecraft, of Stow-Market in Suffolk, Harness and Collar makers, intended to comprise the most interesting particulars relating to King Arthur and His Round Table* (1817), furnished the model for Byron's *Beppo* and *Don Juan.* Frere's fame rests on his admirable translations of Aristophanes, *The Acharnians, The Knights, The Birds,* and *The Frogs,* which were privately printed, and only made public in 1847 by Sir G. Cornewall Lewis in *The Classical Museum.* Consult *Memoir and Works of the Right Hon. John Hookham Frere,* by his nephews, W. E. and Sir Bartle Frere (London, 1874).

FRÈRE-ORBAN, frâr′ ôr′bäN′, Hubert Joseph Walther (1812-96). A Belgian statesman. He was born at Liège, received his education at home and in Paris, and began the practice of law in his native town. He identified himself with the Liberal Party, and was conspicuous in the controversy with the Catholic clergy. In 1847 he was elected to the Belgian Chamber, and appointed Minister of Public Works, and from 1848 till 1852 he held the portfolio of finance. His work, *La main morte et la charité,* directed against the Conservatives, produced a great effect on the position of parties in Belgium. In 1857 the Liberals returned to power and Frère-Orban became once more Minister of Finance and president of the Council. In 1870 the Catholics regained their supremacy and forced him to retire, but from 1878 to 1884 he was again at the head of the Cabinet. Subsequently he led the opposition in Parliament till 1894, when he lost his seat. He was a successful financier and a believer in the doctrine of free trade. His liberalism consisted in the assertion of the authority of the State over the Church and the defense of the system of secular public instruction against the clergy. He was at all times opposed to the undue extension of the suffrage.

FRERICHS, frā′rĭks, Friedrich Theodor von (1819-85). A German physician, born at Aurich, and educated at Göttingen and Berlin. After holding a professorship at Kiel and conducting the clinical institute and hospital in that city, he was for eight years professor of pathology and therapy at Breslau (1851-59), whence he was called to Berlin in 1859, where he became permanently established. He was considered one of the leading medical authorities in the German capital, and as physician on the general medical staff of the Prussian Army, rendered particularly valuable services during the Franco-Prussian War. His principal work is the *Klinik der Leiberkrankheiten* (2d ed. 1861; English translation, 1860, under the title *A Clinical Treatise on the Diseases of the Liver;* also translated into French and Italian).

FRÉRON, frå′rôN′, Elie Catherine (1719-76). A French critic and controversialist, noted as the chief opponent of Voltaire. He was born at Quimper. A brilliant pupil of the Jesuits, he was made professor at the Collège Louis-le-Grand at the age of twenty, and on leaving the Jesuits (1739) was engaged for thirty-five years as contributor to literary journals, in which he carried on a relentless war with Voltaire in particular and against the encyclopædic movement in general. His work is not without cleverness and good literary judgment, but is best remembered for the retorts it evoked from Voltaire, notably *Le pauvre diable, L'Ecossaise,* and *L'âne littéraire* (The Literary Donkey), the title of which parodied that of Fréron's journal *L'Année Littéraire* (1754-76). Fréron wrote also histories of *Mary Stuart* (1742), and of *Germany* (1771), as well as negligible verses. He died in Paris, March 10, 1776. Consult: Nisard, *Les ennemis de Voltaire* (Paris, 1853), and Monselet, *Fréron* (Paris, 1864).

FRÉRON, Louis Stanislas (1765-1802). A French journalist and legislator, son of the preceding, born in Paris. He was educated at the Collège Louis-le-Grand, and first came prominently before the public as editor of the *Année Littéraire.* In 1790 he founded the revolutionary journal *L'Orateur du Peuple.* He was elected a deputy to the convention in 1792, was follower of Danton, and after persecuting the Royalists with great cruelty, contributed to the downfall of Robespierre and attacked the Terrorists, finally entering into negotiations with the Monarchist faction. He was appointed subprefect of Haiti by Napoleon in 1802, where he died soon afterwards from the effects of the climate. His *Mémoire historique sur la réaction royale et sur les massacres du Midi* (1796) contains a defense of his conduct at Toulon in 1793, as commissioner of the Army of Italy.

FRESCO (It., cool, fresh), or **FRESCO-PAINTING.** The term properly applied to painting executed upon plaster while it is still wet or fresh: hence the Italian name *al fresco.* It is also improperly used for all painting executed directly on the surface of a wall by whatever process, even in encaustic (q.v.), the process of burning in with the use of wax, or in *tempera* (q.v.), also called *distempera,* which is the process where water-colors mixed with egg or some glutinous substance are used. The method of true fresco-painting is as follows: A wall, either of brick or stone (better than laths) and perfectly dry, is plastered with lime and water (hydrate of lime), which has been prepared and allowed to stand for at least a year. Before using it is mixed with sand and while the water is in process of being expelled by the carbonic acid in the lime, the pigments must be applied in order that the protective covering of carbonate of lime may form over them. The first and coarser coats, called *arriccio,* may be applied over the entire wall about half an inch thick and with a roughened surface; the two finer finishing coats, called *intonaco,* are applied only on whatever portion of the surface can be painted in a day. This surface is then covered by the corresponding portion of the artist's cartoon, of the same size as the finished fresco is to be. This cartoon is executed usually in black and white and quite sketchily, though the artist often has for further assistance a smaller sized colored sketch for use in the details and color scheme. The impression of the cartoon is left on the plaster either by pouncing or by indenting the outlines with a pointed implement of wood or bone, and the cartoon being then removed, the painter proceeds to apply the colors; these are mostly earths or minerals, as few others will stand the action of lime, and they are ground and applied with pure water. The coloring is necessarily thin, transparent and light, though since the late Renaissance the more liberal use of *impasto* has lessened these qualities, giving greater opacity. When the day's work is finished the artist cuts away any of the plaster that he has not painted on, beveling it at the very edge of his finished work, and the next day the plasterer joins closely another portion of plaster to the edge of the portion painted on the previous day. The lime, in drying, throws out a kind of crystal surface, which protects the color, and imparts a degree of clearness much superior to, and easily distinguishable from, that of a work in tempera or size paint. This process, although apparently simple, nevertheless requires great dexterity and certainty of hand; for the surface of the plaster is delicate, and must not be overworked; besides, the lime only imbibes a certain quantity of additional moisture in the form of liquid colors, after which it loses its crystallizing quality, and the surface, or a portion of it, becomes what painters call rotten. Many frescoes are defective in this way. It is only after the lime has dried that such flaws are discovered; the proper plan in such a case is to cut away the defective portion, have fresh plaster laid on, and do the work over again. But the flaws are too often retouched with tempera or size colors; and though they may escape notice for a time, the parts touched will change or come off in the course of a few years. All retouching must, of course, be done *a secco* on the dry plaster and must be sparingly used. Another difficulty in fresco is that the colors become much lighter after the plaster dries, and for this allowance must be made. However, by practice, the painter may soon get over this difficulty; and he can test the difference between the color as wet and as dry, by putting a touch on a piece of umber he has generally at hand, which instantly dries the color, and shows it as it will be when the lime has dried. *Fresco secco* is a spurious kind of fresco, ordinarily used only in house decorations. The colors are the same, but they are laid on after the plaster is dry. Before the work begins the dry plaster is rubbed with pumice-stone to remove the crust, and then washed with water mixed with a little lime. The effect is coarse, dry, and common, and the thin protecting crust is inadequate to preserve the painting.

The preëminence claimed for fresco-painting is founded on: (1) Clearness and purity of color; (2) a dead surface as far removed from the dullness of tempera as from the gloss of oils and so capable of being viewed from all points; (3) durability under all conditions; (4) cheapness of process; (5) necessity for quick work, precluding the frittering of artistic energy on unessentials. On the other hand, it labors under the disadvantage of the fragility of the plaster, the liability to whitewash, the lack of depth and richness, and the necessity of more or less retouching by another process (*a secco*).

FRESCOBALDI, frĕs′kô-bȧl′dē, GIROLAMO (1583-1644). A celebrated Italian organist and composer, born at Ferrara. Very little of his earlier life and training is known, although he had published a collection of five-part madrigals as early as 1608. He appears to have studied with Luzzaschi in his native place, afterwards taking up his residence in Belgium. Returning to Italy he lived first in Milan, and in 1627 in Rome, where three years later he obtained the position of organist at Saint Peter's. By this time he had acquired wide fame as an organ virtuoso, as many as 30,000 people, it is recorded, having gone to hear his first performance at Saint Peter's. With the exception of one short interval (1628-33), during which period he held the appointment of Court organist at Florence, he retained his position at Rome. He is regarded by many historians and musical authorities as the greatest organist of the first half of the seventeenth century, while as a composer he is scarcely less famous. In the latter capacity he is credited with anticipating the modern key system, and the introduction of advanced ideas in fugal form and musical notation. Frescobaldi's music is the highest type of early seventeenth-century music, and displays the consummate art of the Early Italian School. His vocal compositions include canzones, motets, hymns, and the collection of madrigals already noted. He died in Rome.

FRESENIUS, fre-zā′nē̇-ụs, KARL REMIGIUS (1818-97). An eminent German analytical chemist. He studied at Bonn and at Giessen, and was assistant to Liebig. In 1845 he became professor of chemistry and allied sciences at the Agricultural Institute of Wiesbaden. Fresenius carried out numerous important investigations in analytical chemistry, and did much toward systematizing this art by the publication of excellent works. His exhaustive standard treatises, well known to every student of chemistry, have passed through many editions in German, and have been translated into several languages. They include: *Anleitung zur qualitativen chemischen Analyse*, first published in 1841, and *Anleitung zur quantitativen chemischen Analyse* (1845). In 1862 he founded the *Zeitschrift für analytische chemie*. See ANALYSIS, CHEMICAL.

FRESH-AIR WORK. A form of charity which consists in taking poor children from the slums of great cities into the country or to the seashore for recreation. The first authenticated case of charity of this kind was in 1849, when Rev. William A. Muhlenberg, a pastor in New York City, sent poor and sick people from his parish into the country for short vacations. In 1872 the New York *Times* inaugurated a system of free excursions, and its example was followed in other parts of the country. The first general fresh-air societies were organized in 1874. Since that time, by reason of the earnest support of philanthropists and of such newspapers as the New York *Post* and *Tribune*, the number of such societies has greatly increased. The general agencies in thirty-eight cities furnish as many as a million days' outing to the poor and destitute, while sectarian and private organizations add greatly to this number. In New York City alone, fourteen general and non-sectarian organizations, and no fewer than nineteen denominational and special societies, are in the field. The beneficiaries are, for the most part, children from six to twelve years old, though some of them are infants. A few adult women usually accompany them. They are sent away from the city for periods varying from a few hours to a fortnight spent in the so-called country 'homes,' or as the guests or boarders of private families. As a rule, the parents of the children are not required to bear any of the cost. In London, on the other hand, parents often pay as much as a third or more of the expenses. Some confusion, however, results from this practice. Different fresh-air societies compete with each other, diminishing the contribution which the parent is required to make, thus making impossible the benefits which would result from coöperation.

On the Continent of Europe, *Switzerland* was the first country to develop this form of charity. The Rev. W. Bion, of Zurich, established the first of the Vacation Colonies in 1876. Provision had been made for poor children previously, but it was not until that year that the work was systematized and brought into close relation with the public schools. In 1895 Switzerland had seventy-three of these colonies, to which 2,119 children were sent in that year. The colonies are usually situated in the mountains. Comfortable lodgings and wholesome food are furnished free of charge. Part of the expense is borne by the State and by municipal governments. The organization of fresh-air charity in *Germany* was contemporaneous with its organization in Switzerland. The first children's sanatoriums were organized in Kolberg and Rothenfelde in 1874. Two years later the first children were sent to vacation colonies, and during the twenty years following 300,000 children were cared for at an expense of 15,000,000 marks. In addition, large numbers of children are given excursions lasting a day. Those who are sent to a distance, to seaside or health resorts, are usually accompanied by a teacher. One hundred and twenty-five cities had established colonies before 1896, and were sending 30,000 children to them yearly. It is also common in Germany and Denmark for the artisan classes in the city and country to make a temporary exchange of children during a part of the summer. In *France*, fresh-air charities are less developed than in any other important European country, but they are gradually rising in importance. Paris sent 4254 children to the country and seashore in 1897. Lyons, Bordeaux, Lille, Toulouse, Nancy, Besançon, and other cities have established colonies. The system of placing children in private families to board is preferred to that of sending them to 'homes' or sanatoriums in the country, but the German plan of exchanging city and country children is found unsatisfactory. The vacations are long. The child is often left in the country for a little more than a month, at a cost of about 20 francs.

Vacation colonies have also been established in Spain, Italy, Austria-Hungary, Belgium, Russia, and in Argentina. The system in Europe is superior to the system in the United States in two respects—there is marked coöperation of fresh-air agencies in Europe by means of conferences and exchange of reports; and the work is closely affiliated with the public schools. Consult: Ufford, *Fresh Air Charity in the United States* (New York, 1897); Germain, "Vacation Colonies in Switzerland," *Consular Reports*, vol. lii., No. 193; Comte, "Les colonies de vacances," *Revue philanthropique* (Paris, 1898).

FRESHMAN. See UNDERGRADUATE.

FRESH-WATER MUSSEL. Any of the great many species of Unio or Anodon—bivalve or pelecypod mollusks of rivers and ponds, especially abundant in North America. See MUSSEL.

FRESNEL, frȧ′nĕl′, AUGUSTIN JEAN (1788-1827). A French physicist. He was born at Broglie, and was educated at Caen at the Ecole Polytechnique, and at the Ecole des Ponts et Chaussées. On the completion of his studies he was sent as Government engineer to the Department of Vendée, and afterwards to the Department of Drôme, where he remained till 1814. He lost his position on the return of Napoleon from Elba, because he, as a Royalist, had offered his services to the Bourbons. After the Second Restoration he returned to Paris, where he resumed his duties as Government engineer. In the interval he devoted his enforced leisure with great success to physico-mathematical researches, investigating in particular the polarization of light. In ignorance of the work of Young, Fresnel demonstrated to his countrymen the error of the Newtonian theory of the propagation of light (q.v.) by the emission of material particles, and so ably advocated the undulatory hypothesis that Arago, who was a member of a commission appointed to consider the paper containing the new theory, became an enthusiastic convert to his ideas. Fresnel's crowning experiment, which demonstrated the truth of the theory, was with the two mirrors inclined at an angle of nearly 180°, so that the incident beams were reflected to the same point, and alternate light and dark bands or fringes were seen. This was not caused by diffraction, as the beams were reflected from the surface of the mirrors. With Arago he investigated the action of polarized light, and their discoveries, published in a joint memoir, confirmed the new theory of the mode of the propagation of light. His practical application of scientific optics to the improvement of the lighthouse system was of incalculable value, and he served for several years as a member of the lighthouse commission. See LIGHTHOUSE.

FRESNILLO, frĕs-nē′lyô. A town in the State of Zacatecas, Mexico, 36 miles by rail northwest of the city of Zacatecas; on the Mexican Central Railway (Map: Mexico, H 6). It is situated at an elevation of nearly 6900 feet, and is well built and laid out with broad, straight streets. Stock-raising is carried on in this region, but the town derives its chief importance from the rich silver and copper mines of the Cerro del Proaño, discovered in 1554. There are other mineral deposits. Population, in 1895, 6757.

FRES′NO. A city and the county-seat of Fresno County, Cal., 207 miles southeast of San Francisco; on the Southern Pacific and the Atchison, Topeka and Santa Fé railroads (Map: California, D 3). It has a public library building ($30,000), the gift of Andrew Carnegie, and $100,000 has been appropriated by Congress for a United States Government building. The city is the centre of an agricultural and stock-raising district, has important petroleum interests, and extensively exports raisins, the annual production of which is valued at $3,000,000, wines and brandies, grapes, oranges, olives, and other fruits, besides wheat, sheep, and horses. Under a charter of 1901 the government is vested in a mayor, elected every four years, a municipal council, and administrative officials, all of whom are appointed by the mayor with the consent of the council, excepting the city clerk, police judge, and school directors, chosen by popular vote. Settled in 1872, Fresno became the county-seat in 1874, and was chartered as a city in 1885. Population, in 1890, 10,818; in 1900, 12,470.

FRES′TON. An enchanter in the Spanish romance *Belianis of Greece.* Don Quixote accuses him of stealing his library and changing the giants into windmills.

FRET (probably from OF. *frete*, iron band, ferrule, syncopated from It., ML. *ferrata*, iron grating, from *ferrare*, to bind with iron, from Lat. *ferrum*, iron). A charge in heraldry (q.v.).

FRÉTEAU DE SAINT JUST, frâ′tō′ de săN zhụst′, EMMANUEL MARIE MICHEL PHILIPPE (1745-94). A French politician and magistrate. In 1787 he was imprisoned in the Castle of Doullens for his opposition to the King, but returned to his seat in Parliament a year later. He was elected a Deputy to the States General, and was one of the first of his rank to join the Third Estate. He became a member of the Constitutional Committee, then secretary and twice president of the Assembly. In 1790 he introduced a resolution that only the Assembly, acting on the King's initiative, had the right to make war; demanded that the title of Archbishop should be done away with, and also voted for the suppression of all titles of nobility; and near the end of the year was elected judge in Paris. In 1792 he resigned from the presidency of the First Arrondissement, and retired to his home at Vaux-le-Pénil. Two years afterwards he was arrested on the charge of joining two priests in an attempt to incite insurrection. He was acquitted, but was kept in prison, and two months later was tried and executed for favoring the schemes of Capet, and for complicity with Thouret and Le Chapelier.

FRETS. Pieces of wood or metal placed transversely on the finger-boards of some of those stringed instruments that are plucked by the finger, or played with a plectrum, to mark off the intervals. In the Middle Ages instruments played with the bow had frets, such as the rebec and the viola de gamba. Frets were used by the Chinese, East Indians, Egyptians, and probably were introduced into Europe by the Arabians. They are still used on the guitar, the banjo, the mandolin, and the zither.

FREUND, froint, HERMAN ERNST (1786-1840). A Danish sculptor, born at Uthlede, near Bremen. He was apprenticed to a blacksmith, but afterwards obtained some training at the Academy of Fine Arts at Copenhagen, and in 1817 gained the prize there, which enabled him to travel for three years. In Rome he became the friend of Thorwaldsen, and modeled statues of "Mercury" and "Saint Luke," while still under his influence. In 1827 he executed his masterpiece, the Ragnarök frieze, which was almost destroyed by a fire in the Palace of Christianborg (1884). Among his other works are "Thor," "Odin," a "Child Riding on a Swan," and many monuments and busts. His life was written by his son Victor Freund and edited by Baumann (Copenhagen, 1883).

FREUND, WILHELM (1806-94). A German classical scholar, born of Jewish parents at Kempen, Posen. He was educated at Berlin, Breslau, and Halle, and taught at Breslau (1828-29), at Hirschberg (1848-51), and at Gleiwitz (1855-70). His great work is the *Wörterbuch der lateinischen Sprache* (1834-45). On the same principle are his *Gesamtwörterbuch der lateinischen Sprache* (1844-45) and the *Lateinisch-deutsche und deutsch-lateinisch-griechische Schulwörterbuch* (1848-55). The Latin-English dictionaries by Andrews, Smith, Lewis, and Short, and Riddle and White are all based upon his work. Only a little less important than his lexicographical work was the valuable *Wie studirt man Philologie?* (5th ed. 1885). He also wrote: *Tafeln der Litteraturgeschichte* (1877); *Triennium Philologicum* (3d ed. 1885); a long series of *Präparationen zu den griechischen und römischen Klassikern*, beginning in 1859; and *Wanderungen auf klassischen Boden* (1889-92).

FREY, frī, or **FREYR** (Icel., lord). The son of Niord, of the dynasty of the Vanagods. He was adopted with his father among the Æsir, who, when he got his first tooth, bestowed upon him the celestial castle Alfheim. He is the god of peace and fruitfulness; dispenses rain and fertility; and to him prayers for a good harvest are addressed. He wakens the earth from the sleep of winter. His wife is Gerda, daughter of the giant Gymer. Frey had seen her as he once ascended the lofty seat of Odin, Hlindskialf, from which everything on earth is seen. Gerda was so beautiful that the brightness of her arms illuminated air and sea. Seized with love, Frey sent Skirnir as spokesman, and for his services had to give him his sword, which he will miss in the final contest or eclipse of the gods. His magic ship *Skidbladnir,* which could be folded up like a cloth, respresents the clouds that dissolve at the rays of the sun. Like Freyja, he was the patron of marriage, and probably the two were at one time conceived as united hermaphroditically. Frey was held in great veneration, especially in Sweden, of which he was patron god, in Norway, and from there also in Iceland. His chief temple was at Upsala, where a bloody offering was yearly made to him of men and animals. His festival was at the winter solstice, and while the god was borne round the land all strife was laid aside. Oaths were often sworn in his name, and he was called on to avenge wrongs. He is even called the god of the world and the prince of gods. It is probable that the goddess Nerthus, described by Tacitus in the *Germania* as *terra mater,* was the wife of Niord, and the mother of Frey. Consult Paul, *Grundriss der germanischen Philologie,* i. (Strassburg, 1896, et seq.).

FREY, frī, EMIL (1838—). A Swiss statesman. He was born at Arlesheim, and after studying at Jena, came to the United States, where, during the Civil War, he fought with distinction in the Union Army, and was advanced to the rank of major. In 1865 he returned to Switzerland, where he became distinguished as a statesman and journalist. He was editor of the *Basler Nachrichten* from 1872 to 1882, in which year he was appointed Minister Plenipotentiary to the United States. Returning in 1888, he was in 1893 elected President of the Swiss Confederation. He became an active promoter of educational reform, and an advocate of international legislation for the regulation of factory service. Scarcely less distinguished have been his services in behalf of the construction of the Saint Gotthard tunnel, and of other avenues of intercourse, the modification of the forestry laws, the extension of the fortification system, and the improvement of the Army. In 1897 he was made Director of the International Telegraph Bureau at Bern.

FREY, FRIEDRICH HERMANN. See GREIF-MARTIN.

FREY, HEINRICH (1822-90). A German anatomist and zoölogist. He was born at Frankfort-on-the-Main, and studied medicine at Bonn, Berlin, and Göttingen. In 1848 he was appointed professor of comparative anatomy and histology at Zurich, and professor of zoölogy at the Polytechnic Institute in that city. Most of his works are devoted to histology and microscopy, and are considered among the best productions on those departments of science. Especially important are the following: *Histologie und Histochemie des Menschen* (5th ed. 1876; Eng. transl. by A. E. J. Barker, 1874); *Das Mikroskop und die mikroskopische Technik* (8th ed. 1886; Eng. transl. by G. R. Cutter, 1874); *Grundzüge der Histologie* 3d ed. 1885). He was especially skillful in researches in the subject of microlepidoptera, which topic he discusses in the works entitled *Die Tineen und Pterophoren der Schweiz* (1856) and *Lepidopteren der Schweiz* (1880).

FREY, JAKOB (1824-73). A German-Swiss novelist, who wrote but little, but that of rare quality. He was born at Gutenschwyl, Canton of Aargau, studied at the universities of Tübingen, Munich, and Zurich, was editor of a paper at Aarau, and afterwards at Bern, and having for some years lived at Basel, settled in 1868 at Aarau, where he died. His collection of tales, *Zwischen Jura und Alpen* (1858), the novel *Die Waise von Holligen* (1863), and the three volumes of *Schweizerbilder* (1864 and 1877), are all works of distinction and artistic genius.

FREY, JOHANN JAKOB (1681-1752). A Swiss engraver, born at Lucerne. His success with several engravings after Guido and Albano gave him a high reputation, which he maintained by his other works. He is not always perfect in his line, but there is so much breadth and serenity about his plates as a whole that the fault is readily forgiven. He engraved a number of Carlo Maratta's pictures, a beautiful "Holy Family" after Raphael, "San Carlo Borromeo" after Pietro Cortona, and reproductions of many other Italian painters of the time.

FREY, JOSEPH SAMUEL CHRISTIAN FREDERICK (1773-1850). An American clergyman, born at Mainstockheim (Bavaria), Germany. As a Jew he was instructed in Hebrew theology, in 1794 became a leader in the Synagogue, in 1798 turned Protestant Christian, and in 1800-07 was a missionary of the London Missionary Society among Hebrews in the United Kingdom. In 1816 he came to the United States, in 1818 founded and was appointed pastor of the Mulberry Street Congregational Church, New York City, and in 1820 established the American Society for Meliorating the Condition of the Jews, whose object was to receive and make provision for Hebrew immigrants from all nations. He left the Congregational Church to join the Baptists in 1827, and after having occupied several pastorates in the Baptist denomination, resigned, and in 1837-40 labored with little success in Europe as a representative of the American Society for the Conversion of the Jews. In 1840 he returned to the United States, and later he settled at Pontiac, Mich., where he was instructor in Hebrew in the preparatory department of the University of Michigan. His publications include: *A Narrative of My Life* (1809); *Judah and Israel* (1837); and *Joseph and Benjamin: A Series of Letters on the Controversy Between Jews and Christians* (2 vols., 1842).

FREYBERG, frī′bĕrk, KONRAD (1842—). A German painter of military subjects, born at Stettin. He studied in Berlin at the Academy, and under Steffeck, making a specialty of horses and military groups, and in 1867 went to Paris, where he took the works of Horace Vernet for his model. In 1870 he accompanied the German army to France, in the suite of Prince Albrecht of Prussia, and settling afterwards in Berlin, depicted a number of episodes from that campaign, among which "Prince Frederick Charles and Suite before Paris" (1872), "Surrender of Metz" (1877), and "Episode in Battle of Le Mans" (1879) are the more noteworthy. Of his equestrian portraits and groups, those on a smaller scale are the most successful.

FREYCINET, frȧ'sē'nȧ', Charles Louis de Saulces de (1828—). A French statesman. He was born at Foix, in the Department of Ariège, and was educated at the Ecole Polytechnique in Paris. In 1856 he was appointed *chef d'exploitation* of the Railway Company of the South. From 1856-61 Freycinet undertook several journeys in the employ of the Government, and published as a result of his observations an admirable work on city sanitation. After the fall of the Empire, Gambetta appointed Freycinet Prefect of the Department of Tarn-et-Garonne, and in October, 1870, he was associated with Gambetta as 'personal delegate of the Minister of War.' In this capacity Freycinet displayed remarkable energy and ability, particularly in the rapid organization of the military railway and telegraph service, and the furnishing of the staff with strategic maps. He retired after the armistice, and published *La guerre en province pendant le siège de Paris* (1872). He was elected to the Senate in 1876; was appointed Minister of Public Works in 1877, and was intrusted with the formation of a Cabinet by President Grévy, in 1879, assuming the portfolio of Foreign Affairs. Not being in accord with Gambetta, he resigned the Premiership in 1880; but on the resignation of Gambetta in 1882, Freycinet formed a new Cabinet, which resigned a few months later, upon being refused a vote of credit for the protection of the Suez Canal. In 1885, on the downfall of the Ferry Cabinet, he was summoned by President Grévy to form a new Ministry; but not succeeding in harmonizing the conflicting elements, he entered the Cabinet formed under Henri Brisson. He formed a new Cabinet in January, 1886, but was forced to resign in December. He was Minister of War from 1888 to 1893, being also Premier from 1890 to 1892. He went out of office, together with the rest of the Cabinet, in January, 1893, as a result of the investigations into the Panama affair. From November, 1898, to May, 1899, Freycinet was once more Minister of War, in the Dupuy Cabinet. In 1887 he was elected a member of the Academy of Sciences, and in 1890 a member of the French Academy. He has written a number of works on engineering and mathematics, among others: *Traité de mécanique rationelle* (1858), and *De l'analyse infinitésimale* (1860); also *Essais sur la philosophie des sciences* (1895).

FREYCINET, Louis Claude Desaulses de, (1779-1842). A French naval officer and navigator. He was born at Montélimart in the Department of Drôme, August 7, 1779. In 1795 he took part in several engagements against the English and Spanish, and in 1800 he joined, with his brother Louis Henri, who afterwards rose to the rank of admiral, the expedition sent out under Captain Baudin in the *Naturaliste* and *Géographe* to explore the south and southwest coasts of Australia. Much of the ground already explored by Flinders was revisited. In 1805 Freycinet returned to Paris and was given an appointment in the Department of Marine Maps and Charts. In 1817 he commanded the *Uranie*, in which Arago and others went to Rio de Janeiro to take a series of pendulum measurements. This was part of a larger scheme for obtaining observations, not only in geography and ethnology, but in astronomy, terrestrial magnetism, and meteorology, and for the collection of specimens in natural history. For three years Freycinet cruised about, visiting Australia, the Marianne, Hawaiian, and other Pacific islands, and South America, returning to France, notwithstanding the loss of the *Uranie*, with fine collections in all departments of natural history. He published several scientific memoirs, and two accounts of his travels: *Voyages de découverte aux terres australes pendant les années 1800-04* (2d ed. 1824-25), and *Voyage autour du monde entrepris par ordre du roi*, in 13 volumes (1824-44). He was one of the founders of the Geographical Society of France.

FREYJA, frī'yȧ, **AND FRIG'GA** (Icel., lady, fem. of *Frey*). Two goddesses, spoken of in northern mythology as distinct, but originally one, and intimately associated with Frey. Frigga, in the genealogy of the Æsir (q.v.), is the supreme goddess, wife of Odin, and one of the daughters of the giant Fiörgyn, and presides over marriages. Freyja is the daughter of Niord, sister of Frey, and goddess of love. She is drawn on a car yoked with cats; to her, deceased women go, and also the half of all men that fall in battle, whence she is called Val-Freyja. In this last respect she must be considered as signifying the earth; but the earth is also represented by Frigga, the wife of Odin, and when Freyja seeks Odin, Odin symbolizes the sun. The names Frigga and Freyja are in signification almost alike, and the two are often confounded in mythology. The Anglo-Saxons and Lombards worshiped the wife of Odin as Frea. The name yet survives, probably, in *Friday*.

FREYLINGHAUSEN, frī'lĭng-hou'zen, Johann Anastasius (1670-1739). A German religious poet, born at Gandersheim. He studied theology at Jena, and in 1692 became permanently established at Halle, where he was chief pastor and director of the Pedagogical Institute. His *Compendium der christlichen Lehre* was translated into English by J. Planta in 1804 under the title, *An Abstract of the Whole Doctrine of the Christian Religion*. His *Grundlegung der Theologie* (14th ed. 1744) was also very popular in its day. It is chiefly, however, as a writer of hymns that Freylinghausen is known, among his principal publications of this kind being the *Geistreiches Gesangbuch* (1714), containing 683 songs, and *Neues geistreiches Gesangbuch*, containing 798 songs. These songs obtained a wide popularity in the Protestant Church service, and have been frequently republished. Freylinghausen is said also to have been an excellent musician.

FREYTAG, frī'täg, Georg Wilhelm Friedrich (1788-1861). A distinguished German Orientalist, born at Lüneburg. He studied theology and Oriental philology at Göttingen, and from 1811 to 1813 acted as tutor there. In 1813 he became public librarian at Königsberg, and in 1815 chaplain in the Prussian Army, in which capacity he visited Paris, and remained there after peace was proclaimed in order to continue the study of Persian, Turkish, and Arabic under the famous De Sacy. In 1819 he was appointed to the professorship of Oriental languages in the recently established University of Bonn, and this post he held until his death. He edited and translated into Latin two volumes of Arabic songs, *Hamasæ Carmina* (1828-52), and edited three volumes of Arabic proverbs, *Arabum Pro-*

verbia (1838-43). He also published a Hebrew grammar, and a treatise on Arabic versification. His greatest work, however, was his *Lexicon Arabico-Latinum* (4 vols., 1830-37; abridged edition, 1837).

FREYTAG, GUSTAV (1816-95). A German novelist and dramatic writer of distinction. He was born at Kreuzburg, Silesia, July 13, 1816, studied at Breslau and Berlin, taught as privatdocent at the University of Breslau, and after a brief residence in Dresden went to Leipzig, to become editor of *Die Grenzboten* (1848-70). During this period he had published, together with other dramas of minor interest, *Die Journalisten* (1853), one of the best modern German comedies, still often acted; the admirable novel *Soll und Haben* (1855, translated into nearly all European languages), dealing with the inevitable conflict between the spirit of caste and privilege, rooted in the feudal past of Germany, and the new industrial and democratic spirit of the age; another novel of merit, *Die verlorene Handschrift* (1864); a valuable contribution to the theory of dramatic criticism, *Die Technik des Dramas* (1863), translated into English by McEwen (Chicago, 1894); and the most popular historical essays of his generation, *Bilder aus der Deutschen Vergangenheit* (4 vols., 1859-62). From 1867 to 1870 Freytag represented Erfurt in the North-German Reichstag, and during the French War he was for a time attached to the staff of the Crown Prince. A journal of these days, *Der Kronprinz und die deutsche Kaiserkrone*, published in 1889, revealed, in a way unwelcome to the Court, the liberal tendencies of the deceased Frederick III. and supplemented the brief autobiographic *Erinnerungen aus meinem Leben* that had accompanied Freytag's collected *Works* (22 vols., 1887). His great work since 1870 was the series of historical novels *Die Ahnen* (1872-1880), a monument to the continuity of German character through all the ages of its history and already a classic in its literature. To this national task Freytag gave eight of his maturest years, and he brought to it the preparation of long historic investigations. The stories reach back in *Ingo und Ingraban* to the twilight of German history, and bring the reader to the Christian conversion; show in a second volume, *Das Nest der Zaunkönige*, the growing dominance of the Roman Church; in a third, *Die Brüder vom deutschen Hause*, the struggles of the Teutonic Knights; and in a fourth, *Markus König*, the Reformation and the founding of the Prussian State. The fifth, *Die Geschwister*, deals with the Thirty Years' War; and the last, *Aus einer kleinen Stadt*, with the revival of national life after the humiliations of the Napoleonic conquest. While these novels were appearing, Freytag wrote much for a weekly, *Im neuen Reich;* but in 1879, *Die Ahnen* finished, he withdrew from active life and lived chiefly at Wiesbaden, where he died, April 30, 1895. His complete works were published in 22 volumes (1886-88). For his biography, consult Alberti (Leipzig, 1885), and Seiler (ib., 1898).

FRIANT, frē'äN', LOUIS, Count (1758-1829). A French general, born at Villers-Morlancourt, Somme. After participating in the wars following upon the French Revolution, he accompanied Napoleon as brigadier-general to Egypt in 1798, and was appointed Governor of Upper Egypt by Kléber. He fought with distinction at Heliopolis (March 20, 1800) and Cairo, and was appointed general of division; but after a futile defense of Alexandria was compelled to surrender to the allied armies of England and Turkey (August, 1801). In recognition of his merit, the title of count was conferred on him at the coronation of Napoleon. He subsequently participated in nearly all the great battles of the Napoleonic wars, from Austerlitz to Waterloo, his valor and skill being particularly conspicuous in the attack at Wagram.

FRI'AR (OF. *frere, freire*, Fr. *frère*, Sp. *fray, fraile*, It. *frate*, from Lat. *frater*, brother). A generic name applied to the members of certain comparatively modern religious communities in the Roman Catholic Church, in contradistinction to the older title of monk, which designated especially the Benedictines and their branches, and is only applied by incorrect popular usage to the mendicant Orders The founders of the Dominican and Franciscan Orders, from motives of humility, chose the simple title of brother to designate their followers. Saint Francis called his *fratres minores* friars minor (lesser brothers), while Saint Dominic gave his Order the name of *fratres prædicatores* (preaching friars). The popular English names of these Orders, derived from the color or other distinguishing mark of their habit—such as gray friars (Franciscans), black friars (Dominicans), white friars (Carmelites), crutched friars (Canons Regular of the Holy Cross), and Austin friars (Augustinians)—are preserved to this day in the names of streets and localities in English towns. See MONASTICISM.

FRIAR BACON. A popular title for Roger Bacon. It is employed in a play by Robert Greene, entitled *The Honorable History of Friar Bacon and Friar Bungay*, printed by Edward White, in quarto (1394), and played at Devonshire House in 1591. A prose work, first printed in 1627, was reprinted in Thoms's *Early English Prose Romances* (Pickering, London, 1828), under the title of *The History of Friar Bacon.*

FRIAR-BIRD (so called from its bare head, the ruff of feathers about its head, and its sober plumage). A well-known Australian honey-eater (*Philemon corniliculatus*). It also has other names, as 'Pimlico' and 'four o'clock,' imitative of its loud cry. Several species of the genus inhabit Australia and the Malayan islands to the northward. All are dull drab in color, have the head and neck more or less bare of feathers, and the culmen of the large curved bill furnished with an excrescence. They inhabit the tree-tops, go in small flocks, and are strong, bold, noisy birds, well able to defend themselves. An interesting circumstance connected with them is the fact that in each island where a local species exists there also exists an oriole which 'mimics' its appearance perfectly (see MIMICRY), and thereby escapes much harm from enemies that might easily overcome it did they not mistake it for the more powerful friar-bird. Consult Wallace, *Darwinism* (London, 1889).

FRIAR RUSH. See RUSH.

FRIAR'S TALE, THE. In Chaucer's *Canterbury Tales*, the tale told by the friar Hubert. An archdeacon's summoner enters into a compact with Satan, whom he meets disguised as a yeoman, and is himself carried off by the fiend.

FRIAS, frē'ås, TOMÁS (1805-84). A Bolivian statesman, born at Potosi. He was Secretary of State under several Presidents, until the assassination of Morales in 1872, when he was selected to conduct the affairs of the Government as Acting President. Upon the installation of Ballivian (May, 1873), he became Vice-President, and after the death of the latter succeeded to the Presidency (February 14, 1874). Two years after the completion of his term of office (1877) he was sent as Minister to France. He was considered one of the foremost statesmen of South America, and his influence upon the political development of Bolivia can scarcely be overestimated.

FRIBOURG, frê'bōōr', or **FREIBURG**, frī'bōōrk. A western canton of Switzerland, situated between the cantons of Bern, Vaud, and Neuchâtel (Map: Switzerland, B 2). It has an area of 645 square miles. The southeastern part is high, and may be said to belong to the Bernese Oberland region; the northwestern part belongs to the basin of Lake Neuchâtel. The main rivers are the Saane and the Broye. The mountain forests furnish wood for export; limestone, gypsum, and pitch coal are found. Of the total area, 88 per cent. is productive. Grain, fruit, potatoes, tobacco, and grapes are grown. Dairy products, especially cheese, are exported. Fribourg produces a fine grade of draught-horses, and gives its name to an excellent breed of black cattle. Its manufactures are not important. They include watches, paper, tobacco and cigars, glass, and products of the loom. Straw-plaiting and tanning are leading industries. The canton is administered by a Grand Council, elected by the people, one member for every 1200 inhabitants, and by a State Council consisting of seven members. It sends six representatives to the National Council.

The population in 1888 was 119,155; in 1900, 127,719. The inhabitants are mostly Catholics. French is the official language of the canton, though legislative measures are published also in German. The educational institutions comprise the university at the capital, Fribourg (q.v.), a seminary, a college, and many secondary, elementary, and industrial schools. The ancient dwellers of the land were the Celtic Helvetii. During the great barbaric migrations the district was occupied by the Alemanni in the east and the Burgundians in the west. In the sixth century it came into the possession of the Franks. It passed under the control of the Holy Roman Empire in 1032. The inhabitants refused to allow the spread of Protestantism within their borders. In 1798 the French occupied the land, and it remained under French influence till 1814. The canton, which has always been ultramontane and conservative, is the only one without the referendum and with restricted popular rights. Consult: Berchtold, *Histoire du canton de Fribourg* (Freiburg, 1841-45); Marrot, *Chronique du canton de Fribourg* (ib., 1878).

FRIBOURG, or **FREIBURG**. The capital of the Swiss canton of the same name, situated on the Saane, 19 miles southwest of Bern (Map: Switzerland, B 2). The town stands on a promontory, is ancient, and is irregularly built, with many walls and towers. The river is crossed by a number of fine bridges, including two of the suspension type, of which the larger, built in 1832, is 828 feet long. The most notable buildings are the Church of Saint Michael, formerly belonging to the Jesuits, and the town hall, with its Gothic clock-tower. Among the educational institutions are the university (founded in 1889), the College of Saint Michael, and the lyceum, containing the cantonal museum. The chief manufactures of the town are tobacco, pasteboard, leather, and artistic objects. Two-thirds of a mile south of the town the Saane is dammed. The water-power thus derived is made use of by the factories. Population, in 1888, 12,195; in 1900, 15,794.

FRIČ, or FRITSCH, frĭch, ANTON JOHANN (1832—). A Bohemian geologist and zoölogist, brother of Joseph Václav Frič, born and educated at Prague. He became professor in the Czech University at Prague and was also director of the zoölogical and paleontological department of the Museum of Bohemia. A skilled ornithologist and ichthyologist, he did much to develop Bohemian fisheries. Among his writings are: *Les oiseaux d'Europe* (1832); *Naturgeschichte der Vögel Europas* (1853-71); *Cephalopoden der böhmischen Kreiderformation* (1872); *Geologische Bilder aus der Vorzeit Böhmens* (1873); *Die Reptilien und Fische der böhmischen Kreideformation* (1878); *Fauna der Gaskohle und der Kalksteine der Permformation Böhmens* (1879 sqq.); *Fischereikarte des Königreichs Böhmen* (1888); and *Der Elbelachs* (1894).

FRIČ, JOSEPH VÁCLAV (1829-90). A Bohemian poet, born in Prague. He took so active part in the risings of 1848-49 that he was punished by imprisonment and exile. He went to London in 1859, then to Paris and to Berlin, and in 1879 returned to Prague. His literary productions include the violent anti-Austrian pamphlet, *Pláč korung ceské* (1866); contributions to the Czech periodicals *Blanik* and *Correspondance tchèque*, and to the *Agramer Zeitung* (1870-77); the historical work, with Leger, *La Bohème historique, pittoresque et littéraire* (1868); the dramas *Svatopluk*, *Ulryk Hutten*, and *Mazeppa;* and lyric poems in a Byronic manner, of which *Upir* (1849) is the best example. His collected works, *Sebrané spisy*, were published at Prague (1879-80), and his memoirs appeared in four volumes (Prague, 1885-87). He frequently used the pseudonym 'Brodsky.'

FRICTION (Lat. *frictio*, a rubbing, from *fricare*, to rub). If a solid body with a flat surface rests on a horizontal table, it requires a definite force to start it moving; and if it is set in motion, it will come to rest unless acted upon by a sufficient force. These phenomena are said to be due to the force of 'friction' between the two surfaces. It is found by experiment that the force required to start the motion of one body over the other varies directly as the force pressing the surfaces together, but is independent of the area of contact. The ratio of the force required to produce motion to the force pressing the surfaces together is called the 'coefficient of statical friction.' It varies largely for different kinds of material, and is always diminished by lubricants.

Similarly, if one body is caused to slide over the other, a definite force is required to prevent its motion being retarded; in other words, a force is required to maintain a uniform speed. This force bears a definite ratio to the force pressing the surfaces together, which is called the 'coefficient of kinetic friction,' and is independent of the area of contact. This coefficient is different for different materials, and for the same substances is less than 'the coefficient of statical friction.' It is independent, further, within certain limits of the degree of speed. Some values of this coefficient of kinetic friction are as follows: Oak on oak, fibres parallel, 0.48; the same, with surfaces rubbed with dry soap, 0.16; iron on oak, fibres parallel to motion, 0.62; iron on iron, surfaces well lubricated, 0.04.

The resistance noticed when a wheel rolls on a plane surface with no slipping is not a true case of friction, although it is sometimes called 'rolling friction.' It is due to the plane surface becoming deformed and rolled up in front of the advancing wheel, or to the wheel itself flattening out. This opposition is, however, in most cases extremely small, when compared with sliding friction. Whenever work is done in overcoming friction, the surfaces which are rubbed over each other experience heat effects, and thus friction always causes loss of available mechanical energy. On the other hand, without friction most motions would be impossible—e.g. a man walking, a belt driving a pulley, a train moving on a track, etc. If there were no friction, all these motions would necessarily be produced by cog-wheels or their equivalents.

Friction between solids is due to slight unevennesses on the surfaces in contact, and is therefore what may be called a force between the minute portions of the bodies, and heat effects are produced. The exact mechanical explanation is not evident. In the case, however, of friction between moving layers of liquids or gases it is. It is known that all molecules of these forms of matter are moving about at random through distances which are considerable with respect to their own size; if, then, a layer of fluid is moving relatively with reference to a contiguous layer—e.g. the currents produced in a tumbler of water by stirring a spoon in it, or the currents of air produced by whistling—molecules move freely from one layer into the other. The effect is exactly that of having two long trains of cars, or movable platforms, on parallel tracks, one train in motion, the other not; if enough people step back and forward from one train to the other, the moving one will be slowed up, the one at rest will be set in motion, and finally both trains will be moving at the same speed. If one train is kept at rest, the other will be brought to rest also. Thus, moving layers of liquids and gases are brought to rest. The kinetic energy of the currents goes into increasing that of the molecules, and the temperature is raised. Friction between layers of fluids is sometimes called 'viscosity,' and a fluid is said to be 'viscous' if this frictional force is large.

There is thought to be little, if any, friction between a fluid and a solid, when, for example, the fluid is flowing through a pipe or tube; in general there is a layer of the fluid close against the solid and attached to it, so that any friction is between this layer and the rest of the fluid. In case of a liquid which does not 'wet' a definite solid, the conditions are of course different.

There is still another case of friction to be considered, that between portions of a solid body when it is making elastic vibrations; e.g. a vibrating tuning-fork or spiral spring. When any solid is deformed there is always to a greater or less degree a slipping of layers of the solid over each other, and thus there is produced 'internal' friction. Owing to this, the energy of vibration of the body decreases, the vibrations cease, and the body as a whole has its temperature raised.

FRIDA, frē′dȧ, Emil Bohusch (1853—). A Czech poet, whose pen-name is Jaroslav Vrchlicky. He was born at Laun, Bohemia, was educated at Prague, and was appointed professor of literary history in the Czech university there in 1893. In 1901 he was called to the Austrian House of Peers. His poetic works comprise epics, tragedies, comedies, several novels, and translations from the best writers of France and Italy. Many selections from his works have been translated into German.

FRIDAY (AS. *Frigedæg, Frigdæg,* OHG. *Friatag,* Ger. *Freitag,* from AS. *Frige,* OHG. *Fria,* Icel. *Frig,* a goddess partly identified with the Roman Venus + AS. *dæg,* Ger. *Tag,* day; a German translation of the Latin name *dies Veneris,* day of Venus, whence It. *venerdì,* Fr. *vendredi,* Friday). The sixth day of the week. Among the Germanic peoples it was sacred to the goddess named above, the wife of Odin. In the Christian Church it was in very early times consecrated to the commemoration of the crucifixion of Christ, which took place on that day. (See Good Friday.) The superstition that Friday is an unlucky day may probably be traced to association with this event. Clement of Alexandria, Epiphanius, and other early writers describe the custom of marking it by fasting and prayer. In the Roman Catholic Church it has always and everywhere been a day of abstinence from flesh meat, except when Christmas falls on a Friday. The Anglican churches also designate all Fridays (with the same exception) as days of fasting or abstinence. Since the spread of the devotion to the Sacred Heart of Jesus in the last two centuries, the first Friday of every month has been a day marked for devout Roman Catholics by special observances in honor of it. Among the Mohammedans it is the day for religious gatherings, said to have been chosen by Mohammed in memory of the creation of man, as well as to differentiate his followers from Jews and Christians. They are not required to rest from labor except during the time of the Friday midday prayer, at which all adult males are required to be present. Those who absent themselves on three successive Fridays without a valid excuse are considered to have renounced their faith.

FRIDAY. In Defoe's *Robinson Crusoe,* a savage whom Robinson Crusoe saved from death on Friday, and who became his faithful servant.

FRIDAY CLUB, The. A social club, started by Sir Walter Scott, in June, 1803. It met at Fortune's Tavern, and was probably modeled on Johnson's famous 'Club' at the Turk's Head. A list of the members is given in Lockhart's *Life of Scott,* vol. ii. (Edinburgh, 1850).

FRIDERICIA, frē′dȧ-rē′sē-ȧ, Julius Albert (1849—). A Danish historian. He was born and educated at Copenhagen, and was appointed assistant librarian at the university library in that city in 1891. Many of his works are based upon a careful study of the archives of Denmark, Sweden, Holland, England, Germany, France, and other European countries. His principal works comprise: *Danmarks ydre politiske Historic i Tiden fra Freden i Lybek til Freden i Brömsebro, 1629-60* (1876-82), and *Adelsvældens sidste Dage, Danmarks Historie fra Christians IV's Död til Enevældens Indförelse* (1894). In collaboration with Bricka he published *Christian IV's egenhændige Breve* (1878-91).

FRIDOLIN, frē′dō′lăɴ′, or **FRIDOLD**, frē′dōlt (less frequently Tridolin, or Trudelin), Saint. A Christian missionary of the sixth century, called 'the First Apostle to Allemania.' All that is known of him is derived from a life written four centuries later by Balther, a monk, and containing a great amount of legend, intermingled with historical fact. According to this work, he was a Scot, who, after labors among his heathen countryfolk, went to Poitiers, where he restored the Church of Saint Hilary, much impaired through Arian heresy, to its former prosperity. He afterwards founded a church and a monastery on the island of Säckingen, in the Rhine. He is the patron saint of the Canton of Glarus, Switzerland, on whose coat-of-arms he appears. His day is March 6th. An edition of Balther's *Life* is contained in Mone's *Quellensammlung der badischen Landesgeschichte*, vol. i. (Karlsruhe, 1845). Consult also: Heber, *Die vorkarolingischen Glaubenshelden* (Göttingen, 1867), and Heer, *Sankt Fridolin, der Apostel Alemanniens* (Zurich, 1888).

FRIEDBERG, frēd′bĕrᴋ, Emil Albert (1837—). A German canonist. He was born at Konitz, West Prussia, and was educated at Berlin and Heidelberg. After having been professor in the universities of Halle and Freiburg, he was appointed a member of the faculty at Leipzig in 1869. The new critical edition of the *Corpus Juris Canonici* (1879-81) was prepared by him, as was also the *Formelbuch des Deutschen Handels-, Wechsel- und Seerechts* (3d ed. 1894). Alike in his collaboration in the Prussian Church laws of 1872 and as an author, he showed himself a champion of State supremacy in ecclesiastical matters, and many of his works deal with this subject in its various bearings. Perhaps the best known of his numerous publications are the following: *Die Geschichte der Civilehe* (2d ed. 1877); *Lehrbuch des katholischen und evangelischen Kirchenrechts* (3d ed. 1889); and *Verfassungsgesetze der evangelisch-deutschen Landeskirchen* (1885 et seq.).

FRIEDEL, frē′dĕl′, Charles (1832-99). A French chemist and mineralogist, born at Strassburg. He was educated at the Protestant gymnasium, and subsequently studied, under Pasteur, at the University of Strassburg. After spending a short time in his father's banking business, he went to continue his studies in Paris, where he resided with his grandfather, the celebrated zoölogist Duvernois. After a thorough preparation in the mathematical sciences, he entered the laboratory of Wurtz, with whom he soon formed a close friendship. In 1869 he presented two remarkable theses, one in organic chemistry and one in mineralogy, which immediately attracted to him the attention of the scientific world. In 1871 he became instructor in mineralogy at the Ecole Normale Supérieure, and in 1876 succeeded Delafosse as professor of mineralogy at the Sorbonne. Two years later he succeeded Regnault as member of the Institute. On the death of Wurtz, in 1884, Friedel was appointed professor of organic chemistry and director of the research laboratory at the Sorbonne, a position which he retained to the end of his life. In 1892 he organized and became director of the Ecole de Chimie, a school of industrial chemistry connected with the University of Paris. Friedel's researches contributed extensively to the development of organic chemistry and synthetic mineralogy. The results embodied in his two hundred and fifty-four original memoirs have, without a single exception, joined the structure of science as valuable and indisputably correct data. His classic researches on the acetones, his discovery of the secondary alcohols, his total synthesis of glycerin, his discoveries of many new mineral species and of methods of reproducing many minerals artificially, his discovery of the pyro-electric properties of minerals, his researches on the chemistry of silicon and its organic compounds, and his discovery, jointly with James Mason Crafts, of the synthetic method well known as 'the Friedel and Crafts reaction,' entitle him to a place among the foremost experimental scientists of the nineteenth century. The Friedel and Crafts reaction consists in the action of various chlorinated compounds on hydrocarbons in the presence of aluminum chloride, thousands of different organic compounds being thus conveniently prepared on any ordinary scale. For example, triphenyl methane, which is employed in the manufacture of a number of valuable dyes, can thus be readily prepared in any desirable quantity. As to the compounds of silicon, Friedel, working in conjunction, partly with Crafts, partly with Ladenburg, showed that the element silicon is, like carbon, quadrivalent, and obtained a series of compounds perfectly analogous to the hydrocarbons and capable of yielding many substances perfectly analogous to derivatives of the hydrocarbons. Friedel's book-form publications include a text-book of mineralogy and crystallography, and a work on organic chemistry, entitled *Cours de chimie organique professé à la faculté des sciences de Paris* (2 vols., 1887).

FRIEDELITE. A crystalline mineral magnesium chloro-silicate discovered by Bertrand in the mines of Adervielle. It has a dark-red color and is translucent. It was named in honor of Charles Friedel (q.v.).

FRIEDENTHAL, frē′den-täl, Karl Rudolf (1827-90). A German statesman. He was born at Breslau, and was educated at Breslau, Heidelberg, and Berlin. He became a member of the North German Reichstag in 1867, and was one of the founders of the party known as the Free Conservatives. He was a member of the conference convened at Versailles during the Franco-German War to assist in framing the Constitution of the new German Empire. In 1874 he was appointed Minister of Agriculture, and resigned his post in 1879. His influence upon the economic development of the German Empire was most important.

FRIEDERIKE VON SESENHEIM, frē′dĕr-ē′ke fȯn sȧ′zen-hīm. See Brion, Friederike Elisabeth.

FRIEDLAND, frēd′lȧnt, *Eng. pron.* frēd′land. A town of East Prussia, on the left bank of the Alle, 26 miles southeast of Königsberg. It is celebrated as the scene of one of Napoleon's most splendid victories, gained over the Russians under Bennigsen, June 14, 1807. On June 10th the corps of Soult, Lannes, and Murat had delivered an attack on the Russian intrenchments at Heilsberg, and had been repulsed with a loss of nearly 10,000 men. Napoleon thereupon swung his army to the north of Heilsberg and took up the march for Königsberg, hoping by this manœuvre to entice the Russian commander from behind his fortifications. On the 11th Bennigsen abandoned Heilsberg, and for three days, till the 13th, the two armies were engaged in a race for the threatened town, the Russians advancing by the right bank of the Alle, the French to the left of the river, and at some distance away. On June 13th the corps of Murat and Davout were in the neighborhood of Königsberg; Soult was at Kreutzburg, about 10 miles south of Königsberg, and Lannes was at Domnau, some 15 miles southeast of Kreutzburg. Napoleon, with the Guard and the corps of Victor, Ney, and Mortier, was at Preussisch-Eylau, about five miles from Domnau. Early in the morning of June 14th Bennigsen began the crossing of the Alle at Friedland, in the hope, probably, of surprising Lannes's isolated corps. Had the passage of the river and the attack on Lannes been carried out with rapidity and decision, victory would have certainly resulted for the Russians. But Bennigsen's dilatoriness and Lannes's intrepid resistance allowed time for Napoleon to arrive on the field of battle with the main body of troops and to turn the advantage of numbers in favor of the French, 70,000 against 55,000. The position of the Russians was perilous in the extreme, with the greater part of their forces hemmed in within a narrow arc of the Alle curving behind them. In case of disaster their only means of retreat were the bridges across the Alle at Friedland. Against these bridges, as the key of the situation, Napoleon directed his attack. Mortier, on the left wing, was ordered to content himself with merely holding the enemy in check, while Ney, on the right, was sent against Friedland. The battle began about six o'clock in the afternoon. Ney advanced to the attack under cover of a heavy artillery fire, but his ranks were immediately thinned under the withering cannonade and were thrown back in utter confusion by a smashing charge of the Russian Household Cavalry. The corps of Victor and the division of General Dupont were thrown into the breach, while Sénarmont with thirty guns took up a position 100 yards in front of the infantry line and drove back the Russian cavalry, gaining time for Ney to rally his divisions. A charge by Latour-Maubourg's dragoons and a further advance of Sénarmont's batteries decided the fate of the battle. The Russians fled through Friedland pursued by Ney and Dupont, a part of the army with 120 guns reaching the right bank of the Alle before the bridges were burned. The Russian right, meanwhile, under Gortchakoff, had been skirmishing with Mortier; upon the retreat of Bennigsen, Gortchakoff attempted to retake Friedland, but, failing, was forced to move northward along the river in search of a fording-place, losing one-third of his men in the passage of the river. The loss of the Russians in the battle was nearly 20,000 killed and wounded; the French loss was less than half that number. On June 19th Königsberg fell into the hands of the French; and on June 25th occurred the meeting between Napoleon and the Emperor Alexander at Tilsit (q.v.). Population, in 1900, 2824.

FRIEDLAND, Valentin (1490-1556). A German educator, generally called Trotzendorf, from the little village in Upper Lusatia where he was born, February 14, 1490. He taught for a time in the school at Görlitz, soon after obtaining his baccalaureate from the University of Leipzig; but, adopting the principles of Luther and Melanchthon, he was obliged in 1518 to give up his instructorship. In 1523 he became rector of the gymnasium at Goldberg, in Silesia, for a brief period; he came a second time to Goldberg in 1531, in the same capacity, and remained for over twenty years, making the school so famous throughout Europe that it often had several hundred pupils at once. The school administration was modeled on that of the Roman Republic, thus affording a measure of self-government among the pupils; and Latin was the only language allowed in and out of school. The utter destruction of the buildings by fire in 1554 compelled a removal to Liegnitz, and here Friedland, while superintending the erection of new buildings at Goldberg, died, April 26, 1556. For his biography, consult Pinzger (Hirschberg, 1825) and Löschke (Breslau, 1856).

FRIEDLÄNDER, frēd′lĕn-dĕr, David (1750-1834). A German Hebrew scholar. He was born in Königsberg, Prussia, and was attracted to Berlin by the reform movement under Mendelssohn. There he devoted himself to the emancipation of the Jews, and labored assiduously to improve their condition. He contributed to Mendelssohn's great biblical work, *Das Buch Koheleth* (1772), and also published: *Aktenstücke, die Reform der jüdischen Kolonie in den preussischen Staaten betreffend* (1793); *Sendschreiben an den Propst Teller von einigen Hausvätern jüdischer Religion* (1799); and *Ueber die Verbesserung der Israeliten im Königreich Polen* (1819).

FRIEDLÄNDER, Friedrich (1825-1901). An Austrian painter, born at Kohljanowitz, Bohemia. He studied at the Academy of Vienna, and was a pupil of Waldmüller. Afterwards he studied abroad. His pictures, which are of genre or historical subjects, include: "The Death of Tasso" (1852); "The Interrupted Division" (1863); "Hour of Rest" (1865); "The War Veterans" (1875); "News" (1883); "Distribution of Wine" (1884); and the "Mont-de-Piété" (1886).

FRIEDLÄNDER, Julius (1813-84). A German numismatist. He was born in Berlin, and was educated at Bonn and Berlin. During the last thirty years of his life he was director of the cabinet of coins in the Berlin Museum, which establishment was greatly enlarged under his management. He edited the *Aufsätze und Briefe* of G. Schadow (2d ed. 1890), and published works on the coins of the Knights of Saint John

(1843), the coins of Justinian (1843), and on those of the Ostrogoths (1844) and Vandals (1849); also a monograph entitled *Das königliche Münzkabinett* (with Sallet, 2d ed. 1877).

FRIEDLÄNDER, Ludwig (1824—). A German classical philologist and archæologist, born at Königsberg. He was educated at the gymnasium of his native town and at the universities of Leipzig and Berlin. He became privat-docent at Königsberg in 1847, and full professor in 1858. In 1892 he retired, and has since lived in Strassburg. Friedländer's studies have been chiefly concerned with Roman archæology and the history of Homeric criticism. His most important works are: *Die homerische Kritik von Wolf bis Grote* (1853); *Analecta Homerica* (1859); *De Operibus Anaglyphis in Monumentis Sepulcralibus Græcis* (1847; *Ueber den Kunstsinn der Römer in der Kaiserzeit* (1852); *Darstellungen aus der Sittengeschichte Roms*, etc. (6th ed. 1889-90); and an edition of the *Cena Trimalchionis of Petronius* (1895).

FRIEDMANN, frēd′mȧn, Alfred (1845—). A German author and poet. He was born at Frankfort-on-the-Main, was educated at Heidelberg and Zurich, and became established at Berlin in 1886. He is distinguished alike as a poet and novelist, his poetic productions being characterized by a thorough mastery of form and diction. His works include: *Die Feuerprobe der Liebe; Angioletta,* two poems (3d ed. 1879); and the novel *Zwei Ehen* (3d ed. 1890). His more recent novels are entitled *Inez de Castro* (1898), and *Tantalus* (1901).

FRIEDREICH, frēd′rīk, Nikolaus (1825-82). A German physician. He was born at Würzburg, and was educated in that city and at Heidelberg. In 1857 he was appointed professor of pathology in the University of Würzburg, and director of the Anatomical Institute. From 1858 until his death he held the chair of pathology and therapeutics at Heidelberg, and was clinical director there. In addition to "Die Krankheiten der Nasenhöhlen, des Larynx und der Trachea," in Virchow's *Handbuch der speciellen Pathologie* (1854), he published a valuable work on cardiac diseases, entitled *Die Krankheiten des Herzens* (2d ed. 1867).

FRIEDRICH, frē′drĭk, Johannes (1836—). A German theologian and historian, prominent as a leader of the Old Catholics. He was born at Proxdorf, studied at the universities of Bamberg and Munich, was ordained a Catholic priest in 1859, and in 1865 became professor of theology in the University of Munich, and in 1867 a member of the Academy of Sciences. The most noticeable of his works is the *Kirchengeschichte Deutschlands* (1867-69). He was a pupil of Döllinger, and in 1869 was called to the Vatican Council at Rome. His *Tagebuch während des Vatikanischen Konzils geführt* (1871) and *Documenta ad Illustrandum Concilium Vaticanum* (1871) are important sources of information concerning the proceedings. This council indorsed the Papal infallibility dogma, which Friedrich with Döllinger strongly opposed. Friedrich was consequently excommunicated in 1871, and in 1882 the Minister of Public Worship, yielding to Ultramontane pressure in the Chamber, transferred Friedrich from the chair of theology to that of history. He opened in 1874 the Old-Catholic theological faculty at the University of Bern, and lectured there for a year. Among his works may be mentioned: *Der Mechanismus der vatikanischen Religion* (1876); *Geschichte des Vatikanischen Konzils* (1877-87); *Beiträge zur Geschichte des Jesuitenordens* (1881); *Johann Adam Möller, der Symboliker* (1894); and *Jacob Frohschammer* (1896).

FRIEDRICH, John (1858—). An American violin-maker, born at Cassel, Germany. He was a pupil of Oswald Möckel, a prominent German violin-maker and repairer, came to the United States in 1883, and in a short time ranked among the American leaders in his profession. In addition to violins he has made also bows, violas, and violoncellos of high quality. He received the highest award bestowed for violins, violas, and violoncellos at the World's Columbian Exposition, Chicago, 1893. He has also become known among collectors as an expert in the identification and valuation of rare instruments. Four of the choicest specimens of his violins are in the possession of Dr. Frank Waldo, of Cambridge, Mass.

FRIEDRICH, Kaspar David (1774-1840). A German landscape painter, born at Greifswald. First instructed there by Quisdorf, he studied afterwards at the academies of Copenhagen and Dresden, and fed his fancy in the course of his wanderings on the Baltic coast, in the island of Rügen, and later among the Harz Mountains and the Riesengebirge, become one of the principal exponents of the then dawning romanticism in art. In 1817 he was made a member of and professor at the Dresden Academy. A masterly series of drawings in sepia, depicting scenery in Rügen and other regions near the Baltic coast, are among his most highly prized works. Prominent among his oil paintings are "View in the Harz," and "Moonrise by the Sea" (1823), in the National Gallery, Berlin; and "Repose During Hay Harvest" (1835), in the Dresden Museum.

FRIEDRICH, Woldemar (1846—). A German historical painter and illustrator, born at Gnadau, Province of Saxony. He studied in Berlin under Steffeck, and in Weimar under Plockhorst, Ramberg, and Verlat; took part in the Franco-German War of 1870-71, and after a visit to Italy, in 1873, returned to Weimar, where he was made professor at the School of Art in 1881. Called to Berlin in 1885 as instructor at the Academy, he was awarded the gold medal in 1886 for his allegorical ceiling-painting in the Exhibition Building. Among several other decorative works on a large scale are to be especially noticed "The Diet of Worms" (1892), in the Aula of the Gymnasium at Wittenberg, and the two mural paintings "Art and Science," and "Book-Trade and Printing," in the Booksellers' Exchange at Leipzig. A series of landscapes and genre pictures in water-colors and the illustrations to his work *Sechs Monate in Indien* (1893) were the fruits of a journey to India. In 1889 he became a member of and professor at the Berlin Academy.

FRIEDRICHSRUH, frē′drĭks-rōō. A village and railway station of Lauenburg, Prussia, 16 miles southeast of Hamburg by rail. Population, in 1900, 279. Its celebrity is derived from the proximity of the castle and estate of the Bismarck family, where Prince Bismarck (q.v.) died and is buried.

FRIENDLY, Sir JOHN. A character in Vanbrugh's *The Relapse*, the model of Colonel Townley in Sheridan's *A Trip to Scarborough*.

FRIENDLY ISLANDS. See TONGA ISLANDS.

FRIENDLY SOCIETY. The name given to English benefit associations established as a rule by the workingmen themselves for certain forms of self-help, but now developed into mutual insurance societies. The origin of the friendly society is frequently ascribed to the mediæval guild. They began as sick-clubs composed of small groups, usually neighbors, who met at the public houses, uniting conviviality with the payment of sick benefits and funeral expenses. The large orders arose from the renewed interest of the eighteenth century in Free Masonry. At first they had no regular benefit funds, but grants were made to members in distress. After 1834, when the Poor Laws were changed and the opportunities for thrift were better, societies increased rapidly. Since 1870 an effort has been made to put them on a stronger financial basis.

In general the benefits given by friendly societies are for sickness and funeral allowances. The question of superannuation funds is now important. Other forms of benefit sometimes found are: endowments, insurance for shipwrecks, loss or damage to boats, nets, tools, or implements, medical aid dispensaries, widows' and orphans' funds, convalescent homes, asylums for the aged, and traveling relief for those out of employment. Formerly many local societies existed, but they are gradually disappearing. A frequent form was the dividing society, which shared the surplus at the end of the year. The strongly centralized societies have no social union, but only a business relationship with their members, as the dues are paid through agents or the post-office.

The members are usually clerks, tradesmen, or highly paid artisans. There are two kinds of societies, not properly friendly societies: (1) deposit societies with savings-bank features; and (2) burial societies—some merely local clubs, others large societies with many abuses, in which the cost of the management is 40 to 55 per cent., and which appeal to the poorest classes. Many children are insured in them. There are funeral and local factory and shop clubs for particular trades—often compulsory and subsidized by employers. The large railroad and coal-mining societies provide principally for accidents. The most important friendly societies are the affiliated orders, including the temperance societies and containing the pick of English workingmen and of the lower middle class. The orders are democratic social centres, thoroughly educational in character. Societies for women have not been very successful. The United Sisters' Friendly Society (1885), however, promises well. Juvenile branches lately started have prospered.

Many friendly society acts have been passed since 1783. The act of 1875 is especially important. Royal commissions have made valuable reports (especially those of 1825-27 and 1870-74), showing the weaknesses due to small contributions, mismanagement, and competition. These reports and permissive legislation, providing a legal status and supervision, have aided reform. The solvency of many societies is doubtful. Many societies are still unregistered, and hence statistics are inaccurate. In 1892 there were 29,742 societies, of which 24,598 gave in returns, comprising 8,320,262 members and funds amounting to £26,003,061. The Independent Order of Odd Fellows, Manchester Unity (1822), with 698,328 members in 1897, and an income of £1,294,233, and the Ancient Order of Foresters (1835), with 656,919 members, and an income of £1,240,559, are the leading affiliated orders. The Heart of Oak Benefit Society and the Rational Aid and Burial Association are representative of the centralized associations. Since 1870 the friendly societies have formed an association to watch legislation and protect their interests. This has led to coöperation through medical aid associations and investment associations. Scotland has many societies; they are a later growth in Ireland; several have been introduced into Australia, Canada, and the United States. The friendly society has an important place in the development of the English workingman, but it does not reach equally all grades of the working class, especially the very poor and helpless. Consult: Baernreither, *English Associations of Working Men* (trans. by Alice Taylor, London, 1893); Wilkinson, *The Friendly Society Movement* (London, 1886); id., *Mutual Thrift* (London, 1891); *Nineteenth Century*, 45, 891. See BENEFIT SOCIETIES; INSURANCE; OLD-AGE PENSIONS; POOR LAW.

FRIEND OF MAN, THE. A sarcastic popular title for Victor Riquetti, Marquis de Mirabeau, the father of the revolutionists. It was suggested by the title of his work, *L'Ami des Hommes.*

FRIENDS, THE, or THE SOCIETY OF FRIENDS. A denomination of Christians often known as Quakers, dating from about 1647. In spite of cruel and severe persecutions, the Friends succeeded in establishing themselves in Europe and America. They have never been numerically powerful, having at no time exceeded, if indeed they have ever reached, 200,000 members; but the purity of life which has so honorably distinguished them as a class, has unquestionably exercised a salutary influence on the public at large; while in respect to certain great questions affecting the interests of mankind, such as *war*, *slavery*, and *oaths*, they have, beyond all doubt, originated or emphasized opinions and tendencies which are no longer confined to themselves, but have widely leavened the mind of Christendom.

HISTORY. The founder of the Friends was George Fox (q.v.), who was born in Fenny Drayton, Leicestershire, England, 1624. He began to preach about 1647, and soon drew around him many who, like himself, were "dissatisfied with the teachings and practices of the day, and were longing for a higher and more spiritual life." Neither Fox nor his adherents at first had any intention of establishing a new branch of the Church. Such a result, however, was inevitable from the doctrines which they preached, for such were practically incompatible with the practices of the denominations then existing.

For three or four years Fox's missionary labors were, for the most part, confined to the central part of England. But in 1652 he came into Lancashire, to Swarthmoor Hall, near Ulverstone, the residence of Judge Fell and his wife, Margaret. This able woman became one of Fox's strongest adherents and supporters. From her house as a centre, a band of sixty Quaker missionaries went forth to preach the doctrines of the new religious movement. The continual travels of Fox, and the labors of this band of preachers, enforced by the simplicity, the truthfulness, and the spiritual power of their message, soon gathered thousands of adherents. It is estimated that in London alone there were 10,000. It has often been said that these early preachers were ignorant men from the lower classes. Such a statement is very far from being the truth, as among them were former Independent ministers, officers of Cromwell's army, schoolmasters, and not a few persons of property.

The doctrines held by the Friends, and their refusal`to take any oath, to pay tithes, to obey laws deemed by them iniquitous, such as the 'Conventicle Act' and the 'Five-mile Act,' brought them into constant conflict with the authorities. During the twenty-five years of the reign of Charles II. 13,562 were imprisoned in various parts of England, 198 were transported as slaves, and 338 died in prison or of wounds received in attacks upon their meetings. It was not until after the Revolution of 1688 that they were secure from serious molestation.

The increase in numbers made necessary some kind of organization. That adopted was almost wholly the work of Fox, and in its essential features is still preserved, as described below.

After the time of persecution came a lull in the history of the denomination, and more attention was given to internal affairs than to missionary effort. The 'discipline' was administered rigidly, and the number of members diminished greatly during the eighteenth and first half of the nineteenth centuries. Still, as in America, great attention was paid to philanthropic work. Later, foreign and home mission work was actively entered into, the loss in membership was checked, and a new spirit of earnestness, which still continues, pervaded the body.

The Quaker movement was not confined to England; it spread to Scotland, to Ireland, in some degree to the Continent, and in 1656 to America. In that year Ann Austin and Mary Fisher arrived in Massachusetts. They were cruelly treated, imprisoned, and then sent back to Barbadoes, whence they had come. Similar harsh treatment meted out to others, or even the execution on Boston Common (1659-61) of three men and one woman (see BOSTON; DYER, MARY), did not deter Friends from visiting America. In spite of persecution, converts were made and meetings established in nearly all the English colonies. George Fox himself traveled in America, 1671-72.

Notwithstanding their small numbers, the Friends exercised no little influence in Rhode Island, New Jersey, Virginia, and Maryland. Perhaps the most important incident in their history, whether in the Old or New World, was the settlement of Pennsylvania by William Penn in 1682, and the control of that Colony by the Friends for about seventy years. See PENNSYLVANIA.

Soon after the cessation of persecution the Friends withdrew from active aggressive movements and turned their attention to perfecting and administering their discipline; to the practice of philanthropy, notably to the extinction among their membership of the custom of holding slaves, and to labors in the general anti-slavery cause, also to caring for the American Indians, improving the condition of prisoners, the insane, etc. The rigid application of the 'Discipline,' especially the 'disowning' (depriving of membership) of those who had married non-members, was one of the chief causes of a steady decline in membership which increased in extent as the years went on. The greatest blow to the Friends, however, was the 'separation of 1827-28.' This was a schism due to several causes. The immediate occasion was the preaching and teaching of Elias Hicks (q.v.), a prominent Friend. He promulgated doctrines closely approaching what are usually known as Unitarian views. He also made statements which seemed to undervalue the Holy Scriptures and their divine authority. More than one-half of the Friends in the Middle States followed Hicks, but they were largely in the minority as compared with the whole body of Friends. The larger party was reorganized by the London Yearly Meeting in England. The two divisions are often called 'Orthodox' and 'Hicksite,' and are so distinguished in the United States Census Reports. Neither name is strictly accurate. The smaller division prefer to be called the 'Liberal Branch.'

The effect of the schism upon the 'Orthodox' body was to bring about a movement in favor of a higher education, and a doctrinal belief more nearly allied to that of the so-called 'evangelical' bodies. The leader in this movement was Joseph John Gurney (q.v.), a highly educated and prominent Friend of Norwich, England. This new tendency, however, excited considerable opposition among some of the 'orthodox' Friends in America, which resulted in another separation. These separatists were called 'Wilburites' from John Wilbur, the leader of the movement. The points of difference did not concern the essentials of Christianity, but rather their practical application, and also points of discipline and methods of administration. This schism was not general, and the number of separatists was small.

There remains still another body called the 'Primitive Friends.' They may be described as ultra-Wilburite. They number less than 250 members.

The Friends in Great Britain and Ireland do not differ in any important respects from their brethren in America. Owing to the conscription laws which prevail on the Continent of Europe, it has been almost impossible for the Friends to maintain meetings there. In all, only about 250 members are found. In Australasia there are about 500, and there are a few in Turkey and in Asia.

DOCTRINE. It is perhaps more in the spirit than in the letter of their faith that the Friends differ from other orthodox Christians. This was so from the first. The epistle addressed by George Fox and other Friends to the Governor of Barbadoes, in 1671, contains a confession of faith not differing materially from the fundamental doctrines of evangelical bodies. The Friends have no formal creed or confession, and they have avoided the use of technical theological phraseology. Declarations of faith, however, have been issued from time to time, notably in 1693, 1829, and 1887. In all of these the position taken on essential points of doctrine is substantially the same as that of the great bodies of Protestant Christianity.

Their most distinguishing doctrine is that of the immediate personal teaching of the Holy Spirit to the individual. This has often been called the 'Inner Light,' or the 'Christ Within.' This doctrine has often been misunderstood. Some of the early Friends themselves are not clear in their statements regarding it. George Fox unquestionably states the doctrine truly when he says, "I saw that the grace of God which brings salvation had appeared to all men, and that the manifestation of the Spirit was given to every man to profit withal." "The Lord opened to me," he says in another place, "how every man was enlightened by the divine light of Christ." Robert Barclay in the *Apology* taught that even the heathen were illumined by this light, though they might not know—as, indeed, those who lived before Christ *could* not know—the historical Jesus in whom Christians believe. In consequence of this view the Friends held that every one who lived up to the light which he had would be accepted of God. This fact, however, in no wise relieved the individual from the duty of seeking to obtain more light; neither did it relieve those who had the Gospel from the duty of carrying it to those who had it not. The early Friends were among the most active Protestant missionaries of their day. The doctrine of the direct manifestation of the Holy Spirit to the individual lies at the root of most of their special doctrines. It is the Holy Spirit who calls and qualifies for religious service, therefore *all* believers are 'priests unto God,' and there is no division into clergy and laity.

The Friends, at times, have been charged with undervaluing or at least neglecting the Holy Scriptures. At one time there was in certain places some foundation for this charge, but it arose from a misconception of the fact of divine guidance, and was contrary to the oft-repeated official declarations of the body and of its most respected leaders.

Practice. It follows from the doctrine that the Holy Spirit calls and qualifies whom He will for religious service, that the Friends do not consider human learning a necessary qualification for the minister of the Gospel. They believe that the call to this work, now, as of old, is 'not of men, neither by man,' and that it is bestowed irrespectively of rank, talent, learning, or sex. Consequently they have no theological schools or professors of divinity. At the same time education is not undervalued, and provision is made in nearly all their colleges and higher schools for instruction in Church history, biblical languages, and allied subjects, but above all in the Bible itself. These courses are, however, not restricted to any class, but are open to all.

As fitness for the ministry is held to be a free gift of God through the Holy Spirit, so it ought to be freely bestowed upon others. But on the other hand, whenever ministers are engaged from home in the work of the ministry, they are, in the spirit of Christian love, freely entertained and have all their wants, including traveling expenses, supplied. Of recent years in some places and under some circumstances, a minister receives partial or even whole support; but neither by minister nor by congregation is the ministry put upon a pecuniary basis, neither is it looked upon as a means of livelihood.

Their mode of conducting public worship likewise illustrates their dependence on the guidance of the Holy Spirit. The Friends meet and usually remain in silence until some one believes that he is called upon by the Spirit to speak in exhortation, praise, prayer, testimony, instruction, or the ministry. It follows from this that there may be several communications of different kinds in the same meeting, and the exercise may be from old or young, male or female, from those who are recorded ministers, or from those who are not.

Friends reject the ordinances of baptism and the eucharist as these are observed by other Christians. They believe that the true Christian baptism is a spiritual one, and not one with water. They believe that the true communion is inward and spiritual, and consists not in any symbolic breaking of bread and drinking of wine, but in that daily communion with Christ through the Holy Spirit, and through the obedience of faith, by which the believer is nourished and strengthened. They believe that Christ did not command *any* outward ordinance; that if the true spiritual baptism is experienced, and the true spiritual communion is partaken of, there is no need of any symbol. They believe, moreover, that the symbol tends to call attention away from the essential and beget a reliance upon the outward and non-essential.

The taking and administering of oaths is regarded by the Friends as inconsistent with the words of Christ, "swear not at all," and with the injunction of the Apostle James, "Above all things, my brethren, swear not, neither by heaven, neither by the earth, neither by any other oath; but let your yea be yea; and your nay, nay; lest ye fall into condemnation." They have also steadily refused to contribute to the support of a State Church.

The Friends have likewise consistently protested against war in all its forms; and they have repeatedly advised their members against in any way aiding or abetting military affairs. In support of this belief the Friends have at various times suffered much in person and property. They regard the profession of arms and fighting as diametrically opposed to the general spirit of Christ.

The Friends may certainly claim to have cultivated the moral sense of their fellow-countrymen in regard to the emancipation of the slaves and the abolition of the slave trade. As early as 1688 the Friends of Germantown, Pa., made a written protest against slavery. The feeling that slavery was wrong continued to grow; through the labors of John Woolman, Benjamin Lay, Anthony Benezet, and others the feeling became a conviction of the body, and by the close of the eighteenth century slavery was banished from the Friends.

Discipline. By the term 'discipline' the Friends understand "all those arrangements and regulations which are instituted for the civil and religious benefit of a Christian Church." The necessity for such discipline made itself felt soon after the rise of the body, and the result was the gradual establishment of certain meetings or assemblies. These are four in number: first, the *preparative* meetings; second, the *monthly* meetings; third, the *quarterly* meetings; and fourth, the *yearly* meetings. Preparative meetings are wholly subordinate to the monthly meetings; they have little power; they attend exclusively to local matters, and where they exist must report to monthly meetings. The decided tendency in America is to give them up, and in the new General Discipline they are discontinued. The monthly meeting is the executive power, so far as the membership is concerned, subject to appeal to the quarterly and yearly meeting. It decides in cases of violation of the discipline, and has the power of cutting off or disowning all who by their improper conduct, false doctrine, or other errors, bring reproach on the body. The quarterly meetings are composed of several monthly meetings and exercise a general supervision over the latter, from which they receive reports, and to which they give such advice and decisions as they think right. The quarterly meetings send representatives to the yearly meeting. The term yearly meeting is used in two senses: first, the body of members who live within certain defined geographical limits; of this use mention will be made later on under the head Statistics; second, the annual assembly or conference, consisting primarily of representatives from the quarterly meetings; but every member has the right to take part in the deliberations and conclusions of the assembly. The function of the yearly meeting is to consider the condition of its membership in all its aspects. To it exclusively the legislative power belongs, and from its decisions there is no appeal. As its name implies, it is held but once a year, but in order that the interests of the body might not suffer between its sessions, a meeting was instituted first called the 'Meeting for Sufferings,' because its chief business was to take cognizance of the sufferings of Friends for conscience' sake; then, the 'Representative Meeting'; and still later the 'Permanent Board.' This body has stated times of assembling, but can, if necessary, be called together at short notice.

The officers of the organization are: first, *overseers*, appointed by each monthly meeting for a term of three years; they are two or more in number, usually equally divided between the sexes, and their duties are the oversight and watchful care of the membership; second, *elders*, two or more in number, of both sexes, appointed by monthly meetings with the approval of the quarterly meeting; they now usually hold office for three years; their chief duty is to exercise care over the ministry; third, *ministers;* as already implied, the Friends do not appoint ministers, but 'record' those upon whom they believe the gift is conferred through the Holy Spirit.

There is no doubt that a great change has come over the Friends. This is noticeable in externals rather than in doctrine. Any distinctive garb has been laid aside by almost all members; the use of the 'plain language'—'the thee and thou of the Quakers'—also, except familiarly among themselves, has been practically dropped; and the numerical names of the days and months are used only in official statements and among themselves. It is true some exception to these statements must be made more particularly in regard to the 'Wilburites' and the Friends in Philadelphia Yearly Meeting; but even in the latter the tendency is toward disuse. The discipline is administered in accordance with the spirit rather than the letter, and there is a general falling away from formalism. In many of the meetings of the Middle West and West there are 'pastors' whose duty is pastoral visitation, and the care of the meetings for worship; where the whole time of the 'pastor' is given to such work a very moderate support is generally afforded, but this is an individual matter, and not a Church regulation.

The Friends are an active missionary body, and foreign missions are supported at various points in Madagascar, India, China, Japan, Africa, Mexico, Cuba, and Jamaica, and among the Indians of the United States and Alaska. There is an American Friends' Board of Foreign Missions, whose duty it is to have a general oversight, but not control, of the foreign missionary field. Great efforts have been made to bring about a closer union of the various yearly meetings, for they are now independent. This is shown by general conferences held at various times, and since 1887 every five years. From these conferences the plan of a regular meeting with defined powers to be held every five years has been adopted. This Five Years Meeting, as it is called, is composed of delegates from all the yearly meetings uniting in the plan; the first meeting was held in October, 1902, at Indianapolis, Ind. Besides this a 'Discipline' for all the American yearly meetings has been drawn up and has already been adopted by a majority, and probably will be adopted by all except one or two yearly meetings. This Discipline and the Five Years Meeting form the basis of a union which somewhat resembles that of the United States under the Articles of Confederation. It is too soon to forecast what the result of these efforts will be. All these remarks apply only to the 'Orthodox' body.

A pleasant feature of recent date is the 'Conference on Peace' which was held in Philadelphia in December, 1901. At this conference, for the first time since 1827, members of the different bodies who call themselves Friends met together on a common platform. Fewer changes are to be noted in the other bodies. The 'Hicksites' have not entered into the foreign mission field, but have been active in philanthropic efforts of various kinds, and the different yearly meetings have found a close bond of union in association for this philanthropic work.

The subject of education has claimed the earnest attention of both 'Orthodox' and 'Hicksite' bodies. The former, besides a number of boarding schools, have, for higher education, Haverford College, Haverford, Pa.; Guilford College, N. C.; Wilmington College, Wilmington, Ohio; Earlham College, Richmond, Ind.; Penn College, Oskaloosa, Iowa; Friends' University, Wichita, Kan.; Whittier College, Whittier, California; Pacific College, Newberg, Oregon. Bryn Mawr College for Women, Bryn Mawr, Pa., though controlled by Friends, is undenominational. The 'Hicksite' body has excellent schools, and Swarthmore College, for both sexes, at Swarthmore, Pa. During the past few years general summer schools for the study of religious history and biblical literature have been held at Haverford, Earlham, and Swarthmore Colleges, and elsewhere, besides other summer schools of more limited extent.

STATISTICS. The 'Orthodox' have 16 yearly meetings, viz.: London (for Great Britain), Dublin, Canada, New England, New York, Philadelphia, Baltimore, North Carolina, Ohio, Wilmington (for southern Ohio and Tennessee), Indiana, Western (Indiana), Iowa, Kansas, California, and Oregon; there are also the small communities scattered throughout the world as already noted. The 'Hicksites' have seven yearly meetings: New York, Genesee (western New York), Philadelphia, Baltimore, Ohio, Indiana, and Illinois. The 'Wilburites' have six: New England, Canada, Ohio, Western (Indiana), Iowa, and Kansas. In 1901 the 'Orthodox' in America numbered 93,204 members; in Great Britain and Ireland, 19,955; elsewhere, 761; total, 113,920. The 'Hicksites' in 1890 had 21,992 members; the 'Wilburites' (1890), 4329, the 'Primitive' branch (1890), 232; total, for all bodies, 140,473.

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FRIENDSHIP IN FASHION. A comedy by Thomas Otway, the first work by this playwright which was not in a measure an adaptation of some other drama. It was produced at Dorset Gardens in 1678, with Betterton and Mrs. Barry in the principal parts, and published in the same year with a dedication to the Earl of Dorset. It was well received, but being revived at Drury Lane in 1750, was, on account of its indecency, hissed, in spite of the presence of Mrs. Clive in the cast.

FRIENDS OF GOD (Ger. *Gottesfreunde*). A small body of religious reformers of mystical tendencies, which originated in the fourteenth century, and labored for the reformation of the Church and society, continuing their adherence to the former. The name was derived from John xv. 15. Tauler, the great Dominican mystic of Strassburg (q.v.), and Henry Suso (q.v.) were of the brotherhood, and Meister Eckhart (q.v.) sympathized with it, although probably not belonging to it. It also included many Dominican nuns. The brotherhood is heard of in Basel, Strassburg, and Cologne, but probably had members elsewhere. Sympathizing to some extent with the Brothers of the Free Spirit, they nevertheless avoided the fanaticism ascribed to that body. (See BROTHERS AND SISTERS OF THE FREE SPIRIT.) Consult Jundt, *Les amis de Dieu au quatorzième siècle* (Paris, 1879).

FRIENDS OF THE PEOPLE. An English society founded in 1792 by Sheridan and Grey for the purpose of promoting Parliamentary reform. Among its members were Lord John Russell and Lord Edward Fitzgerald. It was opposed by Fox and Pitt. The reform bills brought forward by Grey in 1792, 1793, and 1797 received scarcely any support. In fact, during the struggle with Napoleon the times were not favorable to any constitutional change; and so the association languished, serving mainly as a school in which were trained the great leaders who forty years later saw its original purpose accomplished in the Reform Bill of 1832.

FRIENDS OF THE TEMPLE (Ger. *Tempelgesellschaft, Tempelverein, Jerusalemsfreunde*). A German sect, called also the Temple Society, and Hoffmannites, who, accepting the Scriptures in full, expect the fulfillment of all the prophecies, and believe it the duty of Christ's disciples to labor to promote that end, as Christ Himself came to do. The first step is to gather the people of God in Palestine, and with this idea, spiritual communities called Temples are instituted in different countries, to assist in the construction of the Temple in the Holy Land. The society originated in Württemberg toward the middle of the nineteenth century, under the lead of the Rev. Christopher Hoffmann. In 1868 a colony was established at Jaffa, the following year one at Haifa, and two others have been added, one at Sarona, near Jaffa, and one at Jerusalem. These colonies number about 1200 members, are prosperous, and have done much for the improvement of the country. The doctrines of the Friends of the Temple have not been formulated into a creed. The spiritual development of the members is a matter to which careful attention is given. The rite of baptism and the Lord's Supper are observed, but are not under definite regulation, individual convictions being allowed to prevail in the choice of the method. Consult: Hoffmann, *Occident und Orient* (Stuttgart, 1875), and *Mein Weg nach Jerusalem* (ib., 1881-85).

FRIES, frēs, ADRIAEN DE. See VRIES.

FRIES, BERNHARD (1820-79). A German landscape painter, born at Heidelberg. He studied at Karlsruhe, and at Munich under Cornelius; traveled in France and Austria, and remained eight years in Italy. His best works are the forty Italian views now at Munich. They are well conceived and carefully painted. His brother ERNST (1801-33) was born at Heidelberg. He was a pupil of K. Kuntz at Karlsruhe, and afterwards studied in Munich and in Italy. Despite his short life, Fries left some excellent pictures, such as "A View of Tivoli," "Sorrento and the House of Tasso," "The Waterfall of Liris at Isola di Sora," "The Castle of Massa," and "A View of Heidelberg." The works show a sincere feeling for nature.

FRIES, ELIAS MAGNUS (1794-1878). An eminent Swedish botanist. He was born in the parish of Femsjö, and studied at the University of Lund, where he became demonstrator in botany in 1828. In 1834 he went to the University of Upsala as professor of economic science, to which chair, after the death of Professor Wahlenberg, in 1851, was united the chair of botany. In the latter year he was also appointed director of the Upsala Botanic Garden, and in 1859 he retired from active work. Fries made important contributions to all departments of systematic botany, but especially to the knowledge of lichens, fungi, and mosses, upon which groups of plants he wrote many important works. Some of his publications are: *Systema Mycologicum* (3 vols., 1820-32); *Elenchus Fungorum* (2 vols., 1825); *Lichenographia Europæa Reformata* (1831); *Flora Scanica* (1835); *Sind die Naturwissenschaften ein Bildungsmittel?* (1844); *Summa Vegetabilium Scandinaviæ* (2 vols., 1846-49); *Novæ Symbolæ Mycologicæ* (1851); *Monographia Hymenomycetum Sueciciæ* (2 vols., 1857-63); *Epicrisis Generum Hieraciorum* (1862); *Sveriges ätliga och giftiga svampar, Fungi Esculenti et Svenenati Scandinaviæ* (1862-69), with 93 colored plates; *Botaniker utflygter*, three volumes of collected short papers (1843-64).

FRIES, Jakob Friedrich (1773-1843). A German philosopher, born at Barby, Saxony. He studied there and in the universities of Leipzig and Jena, and became a lecturer in philosophy at the latter in 1801. From 1805 to 1816 he was professor of philosophy and elementary mathematics at Heidelberg, and from 1816 until his death professor of theoretical philosophy at Jena. His chief work is the *Neue Kritik der Vernunft* (3 vols., 1807), an attempt to find a new basis for the critical philosophy of Kant. His method is psychological. He holds that a knowledge of the *a priori* cognition of Kant is to be attained only by the *a posteriori* process of subjective experience. Hence, the *a priori* element, inasmuch as it is discoverable only by subjective experience, is not, as Kant contends, transcendental to all experience. Therefore, philosophy finds its ultimate foundation in subjective knowledge, and its true exposition through psychological analysis. Other differences from the Kantian teaching are also encountered in Fries, whose work, though ingenious, may be said to contribute little to the progress of speculation.

FRIES, John (c.1764-1825). The leader of the so-called 'Fries Rebellion' in Pennsylvania in 1799. He was the son of a Pennsylvania farmer, and was successively a cooper's apprentice, a soldier (during the Whisky Insurrection), and an auctioneer. In July, 1798, Congress voted a direct tax of $2,000,000, $237,000 of which was fixed upon, in January, 1799, as Pennsylvania's quota. Soon afterwards Federal officers began to make the assessments. In Pennsylvania the tax fell chiefly on houses and lands, the value of the former being determined by the number and size of the windows. Among the Germans in the counties of Montgomery, Lehigh, Bucks, and Berks, a regular opposition, under the leadership of Fries, was organized to the assessment of this 'window tax.' This led to open conflict with the Federal officers, and at Bethlehem, on March 7th, a considerable force of disaffected farmers under Fries compelled the United States marshal to liberate thirty prisoners who had been arrested for opposing the law. Finally the militia was called out by President Adams, and many of the rioters, including Fries, were captured and taken to Philadelphia. Here Fries was twice tried for treason, and was each time found guilty and sentenced to death, but was eventually (April, 1800) pardoned by President Adams, who, at about the same time, issued a general amnesty to all who had been concerned in the uprising. Afterwards Fries settled in Philadelphia, and acquired a considerable fortune in the tinware trade. Consult Davis, *The Fries Rebellion* (Doylestown, Pa., 1899); and, for an account of the trial, *Das erste und zweite Verhöre von John Fries* (Allentown, Pa., 1839).

FRIESE, Richard (1854—). A German animal and landscape painter, born at Gumbinnen, East Prussia. He studied at the Academy in Berlin, where, after traveling in the East, in Norway, and as far as the polar regions, he rapidly acquired his present reputation as one of the best animal painters in Germany, especially noted for his vivid delineations of the lion's life in the desert, and also of the native deer world in the German forest. The distinctive conception and tone of the landscape portion in his pictures deserve especial comment. He was awarded a gold medal in 1886, and elected a member of the Berlin Academy in 1892. His most noteworthy productions include: "Lions Surprising Caravan's Camp" (1884), Dresden Gallery; "Elks on Field of Battle" (1890), National Gallery, Berlin; and "In the Bredszell Moor" (1895), Königsberg Museum.

FRIESEN, frē'zen, Hermann, Baron (1802-82). A German Shakespearean scholar. He was educated at Leipzig and Göttingen, and occupied several positions at the Court of Saxony. He became known for his *Briefe über Shakespeares Hamlet* (1864), and *Shakespeare-Studien* (1874-76). He also made valuable contributions to the *Jahrbuch* of the German Shakespeare Society.

FRIESEN, Karl Friedrich (1785-1814). A German patriot, and one of the principal promoters of gymnastics in Germany. He was born at Magdeburg. He studied at the Academy of Architecture, Berlin, collaborated on the great atlas of Mexico edited by Humboldt, and from 1810 was an instructor in the Plamann Institute. In 1810-12 he rendered important services to Jahn in the establishment of German gymnastics. Upon the outbreak of the German War of Liberation, in 1813, he assisted in organizing the famous volunteer corps of Major von Lützow, whose adjutant he became. After the dispersion of the corps by Napoleon at Rheims, he was captured and shot by the French at La Lobbe, Ardennes, March 15, 1814. In 1843 his body was buried with solemnity in the military cemetery at Berlin. He has frequently been celebrated by German writers, in particular by E. M. Arndt in "Es thront am Elbestrande." Consult Schiele, *Friedrich Friesen Eine Lebensbeschreibung* (Berlin, 1875).

FRIESEN, Richard, Freiherr von (1808-84). A statesman of Saxony. He was born at Thürmsdorf, Saxony, was educated at Göttingen and Leipzig, entered the civil service of Saxony, and rose to be Minister of the Interior from 1849 to 1852. In 1858 he became Minister of Finance, and in 1867 of Foreign Affairs also. He was appointed in 1870 a commissioner to arrange in Versailles with the South German States treaties looking to the unification of Germany. From 1871 until his retirement in 1876 he was president of the Ministry. Consult his *Erinnerungen aus meinem Leben* (Dresden, 1880).

FRIESIAN, or **HOLSTEIN-FRIESIAN CATTLE.** See Dairy Cattle, under Cattle.

FRIESLAND, or **VRIESLAND,** frēz'land (Lat. *Frisia*). A northwestern province of the Netherlands, bounded by the North Sea, Zuyder-Zee, and the provinces of Groningen, Drenthe, and Overyssel (Map: Netherlands, D 1). Area, 1282 square miles. The land is flat, and in some parts below the level of the sea, against the incursions of which it is protected by numerous dikes and sluices. Streams are few, but there are numerous canals and lakes abounding in fish. About 60 per cent. of the area being composed of meadows and heath, Friesland is better adapted to pastoral than purely agricultural industries. It breeds excellent horses and other domestic animals, which, with dairy products, are the chief exports. The manufacturing industries are comparatively insignificant. The capital is Leeuwarden (q.v.). The West Frisian Islands form a part of the province. Population, in 1899, 340,262.

FRIETCH'IE, Barbara. See Barbara Frietchie.

FRIEZE (OF. *frise, frize*, Fr. *frise*, OIt. *frigio, friso, fregio*, It. *fregio*; probably from ML. *phrygium, frisium*, embroidered work, from Lat. *Phrygius*, Gk. Φρῦγιος, *Phrygios*, Phrygian, from Φρυξ, *Phryx*, Phrygian; otherwise connected with OF. *friser, frizer*, Fr. *friser*, OFries. *frisle, fresle*, hair of the head). In classical architecture, the central division of the entablature (q.v.). In the Doric style the frieze is cut into sections by triglyphs (q.v.), the interspaces being called metopes (q.v.). In other orders the frieze is continuous and usually plain, being ornamented only in the Roman period and in the Corinthian order by a scroll-work decoration. It is also called (by Vitruvius) the zophorus, from its being frequently ornamented with sculpture. From the same cause the term frieze is sometimes applied to any enriched horizontal band in any style of architecture.

It is then not necessarily a part of an entablature, and the enrichment may be that of painting, mosaic, carving, inlay, or any other form of decoration. Richly sculptured friezes are those of the Choragic monument of Lysicrates, the mausoleum of Halicarnassus, the Xanthus tomb, the Treasury building at Delphi, the temple of Nike Apteros at Athens, that of the temple of Apollo at Phigaleia, of the Pergamon altar, and the temple; but the masterpiece of all Greek friezes is that of the Parthenon.

FRIEZE, Henry Simmons (1817-89). An American scholar and writer. He was born in Boston, Mass., September 15, 1817. After 1830 he became a clerk and organist. He was graduated at Brown University in 1841, and until 1845 was instructor in the university. From 1845 to 1854 he was instructor in the grammar school of the university. He then left Brown to accept the professorship of Latin at the University of Michigan, a position which he held until his death, in December, 1889. From 1869 to 1871 he was acting president of the university, during which period most of the academic privileges were thrown open to women. Frieze devised a system of inspection which established an official connection between the university and the high schools of the State. In the year 1880-81 he was again acting president. The degree of LL.D. was conferred upon him by Chicago University and Kalamazoo College in 1870, by Brown in 1882, and the University of Michigan, 1885. He edited Vergil's *Æneid* and books x. and xii. of the *Institutes* of Quintilian, delivered and published addresses on *Ancient and Modern Education* and *Art Museums*, and presented valuable reports to the Michigan State Board of Regents. His last work was *The Story of Giovanni Dupré* (1886).

FRIGATE (from OF. *fregate*; possibly from Lat. *fabricata*, sc. *navis*, ship, p.p. of *fabricari*, to build, from *fabrica*, workshop, from *faber*, artisan). A war-ship of a type which has not been built for more than half a century. The term was used in the Mediterranean in the fourteenth and fifteenth centuries—and perhaps for many centuries before—to designate a narrow, fast-sailing vessel, fitted also to be propelled by oars, and having holes in the sides for the passage of the latter resembling gun-ports. These vessels were small, and were used for ordinary purposes of traffic and not for war. Their shape and speed caused the model to be followed for larger craft adapted for heavy weather in the open sea. In the sixteenth century the term was very generally applied to merchant ships in all the countries of Western Europe. Toward the close of the century certain of these merchant frigates were hired for service in the English Navy; but they appear to have been quite small craft. The first frigate built in England was the *Constant Warwick*, built at Ratcliffe by Peter Pett the elder, as a privateer for the Earl of Warwick, and afterwards purchased by the Government. The model was taken from a French frigate, according to the Earl's son; but Pett, or his friends, claimed that he was the inventor of the frigate. The *Constant Warwick* carried 26 guns as a privateer; but the battery was gradually increased to 42 guns in 1677. The distinguishing characteristics of frigates grew to be speed and handiness combined with moderate size. The type began to crystallize during the seventeenth century, and soon after the middle of the eighteenth it was well established. Frigates were then rated as forty-fours, thirty-eights, thirty-sixes, thirty-twos, twenty-eights, and twenty-fours, according to the number of guns carried. Ships carrying less than 32 guns were rarely frigate-built, and it was common for frigates to carry several guns more than implied in their rating, particularly after the introduction of carronades (q.v.). At the beginning of the nineteenth century a frigate was a vessel carrying guns on one covered deck and on an uncovered deck above this. If these were all long guns the gun-deck (lower) battery consisted of 26 to 32 long 18-pounders or 12-pounders, and the spar-deck battery of six to twelve 6, 9, or 12 pounders. The rig was that of a ship, three masts, square-rigged on all. The tonnage—a rather uncertain measure of size—of the British frigates varied between 500 and 1200; some of the United States Navy were larger. (See Constitution; also, section on Navy, in article United States.) After the application of steam to war-vessels, the term frigate steadily lost significance, and is now no longer used, except in some European navies, where *captain of frigate* is a title of rank of naval officers answering to that of commander in the United States Navy.

FRIGATE-BIRD (so called from their attacks on other sea-birds), or Man-of-War Hawk. A sea-bird (*Fregata aquila*) of the order Steganopodes, related to the pelicans, and hence sometimes called 'frigate pelican.' It is a large bird with black plumage, sometimes measuring 10 feet from tip to tip of its extended wings, and is capable of very powerful and rapid flight. It inhabits the intertropical coasts, both of the Atlantic and Pacific oceans, often flying out far to sea, but most of the time remaining near shore. Its aërial evolutions are extremely graceful, and it soars to a great elevation. It is said never to dive for its prey, but to seize fishes only when they appear at the surface or above it, and flying fishes constitute no small part of its food. It also pursues gulls and terns, and eats the fish which it forces them to disgorge. The feet are very small, but the bill is five inches long and strongly hooked at the tip. A closely allied species (*Fregata minor*) is found in the Pacific and Indian oceans, and the two comprise the whole genus, which is the only one in the family Fregatidæ. These birds breed in companies on the ledges of sea-cliffs, on trees near shore, or on the ground of oceanic islets, making a very rude nest and laying a single white egg. In the breeding season the gular pouch of the male becomes a vivid scarlet and is greatly distended, so that these birds form very striking objects as they roost upon the ground or wheel about in the throng of the colonies. The interior of the pouch is in communication with the air-sacs of the neck, and is filled or emptied (slowly) through the bronchi. When full it is a semi-transparent balloon, and reaches forward as far as the end of the beak, and downward so as to completely hide the breast. When empty it retracts to invisibility between the rami of the lower mandible.

FRIGATE-BIRDS.
In the foreground is a male with distended pouch.

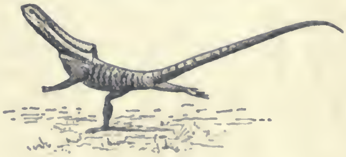
Consult: Bennett, *Gatherings of a Naturalist in Australia* (London, 1860); Mosley, *A Naturalist on the Challenger* (London, 1879); Buller, *Birds of New Zealand* (2d ed., London, 1888); Forbes, *Wanderings in the Eastern Archipelago* (New York, 1885); Leiter, account of nesting of frigate-birds on Phenix Island, South Pacific Ocean, in *Proceedings of the Zoölogical Society of London* (London, 1891). See Tropic-Bird, and also Plate of Fishing Birds.

FRIGATE MACKEREL. A species of mackerel (*Auxis thazard*) abounding in all warm seas, sometimes in immense schools, but of little value. See Mackerel.

FRIGGA, frĭg'ȧ. See Freyja.

FRILL-BACK. A domestic pigeon of an East Indian breed, whose feathers are wholly turned forward. The beak is very short.

FRILLED LIZARD. A large agamoid lizard (*Chamydosaurus Kingii*) of the tropical parts of Australia, remarkable for its erectile ruff and for its running on two legs only. Its habits are sylvan, and its chief resort is the trunk or lower limbs of a tree. It subsists on beetles almost exclusively, all captured alive and in daylight. At night it rests clinging to the bark in an upright position. Its ordinary attitude is with the hind legs spread and flexed, letting the vent and tail rest upon the ground, while the fore part of the body, with the head uplifted, is supported high upon the stiffened forearms. When this lizard runs, however, it holds the fore part of the body clear of the ground and goes upon the hind legs alone, after the manner of a bird. This feature, and its bearing upon the animal's ancient avine and lacertilian relationships, are discussed by Professor Saville-Kent in the *Proceedings of the Zoölogical Society of London* for 1895, pp. 712 to 717. The same specialist describes, from a study of captive examples, the skin membrane about the neck as a denticulated frill, which in old lizards may measure eight or nine inches in diameter. It may be erected or depressed at will; but as slender processes of the hyoid bone extend into it, the membrane cannot be expanded unless the mouth is open, nor can the opening of the jaws fail to lift the bill, which is otherwise folded inconspicuously upon the neck. (See Lizard.) It is dun-colored on the outside, like the rest of the body; but its inside, brought to view when erected, is brilliant with red and yellow mottlings, as also are the parts of the head otherwise concealed. Its function, evidently, is to act as a 'scare' organ. The sudden expansion of this gaudy disk in the face of an enemy, with the wide-open, sharply hissing mouth in the centre, followed, as a rule, by an instantaneous rush forward, is calculated to terrify the foe completely. In addition to this harmless demonstration, the long, whip-like tail is vigorously lashed from side to side, and able to inflict sharp blows likely to be both disconcerting and painful. Compare Jew Lizard, and consult Saville-Kent, *The Naturalist in Australia* (London, 1897).



A FRILLED LIZARD, RUNNING.

FRIMAIRE, frē'mâr' (Fr., sleety). The third month in the French Republican Calendar of 1793. It began on November 21st in years 1 to 3 and 5 to 7; on November 22d in years 4, 8 to 11, 13 and 14; and on November 23d in year 12.

FRIMONT, frē'môN', JOHANN MARIA, Count, Prince of Antrodocco (1759-1831). An Austrian general, born at Finstingen, Lorraine. He studied at the Collège at Pont-à-Mousson, entered the Austrian Army in 1776, fought against Napoleon, and by 1812 was commanding a cavalry division under Prince Schwarzenberg. In 1815, with the rank of general of cavalry, he was in command of the Austrian forces in Northern Italy, and subsequently of the army of occupation. He was appointed in 1821 to the chief command of the army sent to restore order at Naples and suppress the Carbonari. On March 24th he entered the city in triumph. In 1831 he became president of the Council of War.

FRINGES (dialectic Fr. *frinche,* ML. *fringia,* OF., Fr. *frange;* probably from Lat. *fimbria,* border, fringe). In optics, the alternate bands of light and dark, due to the interference of waves of light, which are produced when a beam passes the sharp edge of a screen, or is transmitted through a narrow slit or hole, or bi-prism, or by reflection from a Fresnel mirror, are called fringes. See DIFFRACTION; INTERFERENCE; LIGHT.

FRINGES. In the English Bible, the translation of the Hebrew *gedilim* in Deut. xxii. 12, and of *sisith* in Num. xv. 38. The marginal reading of the Revised Version, 'twisted threads' and 'tassels,' is probably better. In the passage in Deuteronomy the Hebrews are commanded to place fringes upon the four corners of their robes; in Numbers, in a later passage, the description is more detailed, and the reason is assigned "to remember all the commandments of the Lord." The injunction was much elaborated by the rabbis, and made a matter of the first importance in Judaism (cf. Matt. xxiii. 5). Originally the garment to which the fringes were attached was the outer one; passages in the Gospels in which it is stated that the healing power of Jesus was experienced if the hem or border of His garment were touched doubtless refer to the fringes or tassel (Matt. ix. 20; xiv. 36; Mark vi. 56; Luke viii. 44). In the course of time, because of persecution, the fringes came to be concealed, and are now put by orthodox Jews on a separate garment worn under the outer, reaching only to the chest, and called the smaller *tallith,* to distinguish it from the larger *tallith,* which also has fringes and is worn only during the recital of the prayers. In form it is a modern survival of the ancient dress of the Jews. The wearing of fringes is doubtless based on some ancient custom of a religious character; possibly they were regarded as amulets. Consult: Robertson Smith, *Religion of the Semites* (London, 1894); Nowack, *Hebräische Archäologie* (Freiburg, 1894).

FRINGE-TREE (*Chionanthus*). A genus of plants of the order Oleaceæ, consisting of small trees or large shrubs, natives of America and China. The common fringe-tree, or snowflower (*Chionanthus virginica*), is found in the United States from Pennsylvania and Delaware to the Gulf of Mexico, and west to Texas. It sometimes attains the height of 20 or 30 feet, but is rarely more than 8 or 10 feet high; has opposite oval leaves 6 or 7 inches long, and very numerous snow-white flowers in panicled racemes. The limb of the corolla is divided into four, sometimes five or six, linear segments an inch or more long, whence the name fringe-tree. The fruit is an oval drupe. The tree is frequently cultivated as an ornamental plant.

FRINGE-TREE.

FRINGIL'LIDÆ (Neo-Lat. nom. pl., from Lat. *fringilla,* a sort of small bird, probably the chaffinch). A family of typical passerine birds, having a conical or nearly conical bill, sometimes short and thick, sometimes comparatively slender and elongated, sometimes convex above, below, or at the sides, the commissure—line of junction of the mandibles—straight. The neck is short, and neither the tail nor the wings are long. The Fringillidæ are all small birds, and feed chiefly on seeds, but to some extent also on insects. The family is an extremely numerous one, and is distributed over all parts of the world. It is represented in America by finches, sparrows, grosbeaks, crossbills, etc., elsewhere described, and has by some systemists been placed at the head of the list of all birds, being regarded as the most highly organized group. (See FINCH.) Typical forms are illustrated in the plates FAMILIAR SPARROWS; BUNTINGS AND GROSBEAKS; CAGE-BIRDS.

FRISCH, frĭsh, JOHANN LEONHARD (1666-1743). A German philologist and lexicographer, born at Sulzbach. He studied at Altdorf, Jena, and Strassburg, was for a short time a pastor at Neusohl, Hungary, and after extensive travels settled at Berlin, where in 1727 he was appointed rector of the Gymnasium zum Grauen Kloster. In 1706 he became a member of the Royal Scientific Society, and in 1731 director of the historical-philological division. Best known and most important of his works is the *Teutsch-lateinisches Wörterbuch* (1741), the result of thirty years' labor, and the first to be prepared on scientific principles.

FRISCHES HAFF, frĭsh′ĕz häf (LG., Fresh-water Bay). A large lagoon on the northern coast of Prussia, southeast of the Gulf of Danzig (Map: Prussia, H 1). It is rather less than 60 miles in length from northeast to southwest, with a breadth which varies from 2 miles to 18 miles, and an area of 330 square miles. It has a depth of from 10 to 16 feet, and was once entirely walled off from the Baltic by the Frische Nehrung, a narrow spit of land extending for about 40 miles along its northern shore. In 1510, however, the waters of the Frisches Haff broke over the Frische Nehrung, and formed the passage called the Gatt, which unites the lagoon with the Baltic. The Gatt is only from 10 to 15 feet in depth. All large vessels load and unload at Pillau, which is situated at the mouth of the Gatt, on the shore of Danzig Bay. Cargoes are conveyed to and from the ports on the Frisches Haff by means of lighters. The lagoon receives the waters of the Nogat, Pregel, Frisching, and Passarge and part of the waters of the Vistula.

FRISCHLIN, frĭsh′lēn, NIKODEMUS (1547-90). A German philologist and Latin poet, born at Balingen, Württemberg. He studied at the University of Tübingen, and became professor of history and poetry there in 1568. Through the jealousy of his colleagues and the hatred of the nobility, whom he had angered by his satiric wit, he was compelled to relinquish his chair, and in 1582 became rector of the school at Laibach in Carniola. From 1584 to 1587 he was again at Tübingen, but in 1588 became rector of a school at Brunswick. Expelled thence in 1589, as the result of a pasquinade, he wandered about for a time, and finally was imprisoned in 1590 in the Hohenurach Dungeon at Mainz. He broke his neck in an attempt to escape. He wrote in Latin some indifferent tragedies; a few comedies, of which the best is *Julius Cæsar Redivivus* (1584); and poems, including principally *De Natali Jesu Christi*, and the *Hebræis*, a hexametric chronicle of the Jewish kings. His philological study is best represented by the *Grammatica Latina* (1585). Consult Strauss, *Leben und Schriften des Dichters und Philologen Frischlin* (Frankfort, 1856).

FRIS′CO. A popular abbreviation of the name San Francisco.

FRISI, frē′zē̂, PAOLO (1728-84). An Italian mathematician. He was born at Milan, taught philosophy at Padua, and became, in 1756, professor of mathematics at Pisa, and in 1764 at Milan. When less than twenty-three years of age he published a remarkable *Disquisitio Mathematica* (1751), upon the physical causes which have determined the magnitude and shape of the earth. He also published: *De Atmosphæra Cœlestium Corporum* (1758); *De Inæqualitate Motus Planetarum* (1760); and *Del modo di regolare i fiumi e i torrenti* (1762).

FRISIAN LANGUAGE AND LITERATURE (OFris. *Frise*, *Frese*, AS. *Frisa*, ML. *Friso*, Lat. *Frisii*; possibly connected with OFris. *frāse*, danger, AS. *frāsian*, Goth. *fraisan*, OHG. *fraisōn*, to test). The language and literature of a branch of the Germanic family of dialects which was formerly spoken along the coast of the North Sea and on the coast islands from the Rhine to the Ems. The Frisians are first mentioned by Tacitus, who divides them into the greater and the lesser. Their boundaries varied at different periods, however, so that the entire coast-line from the Scheldt to the Weser has at one time or another been occupied by those who spoke the Frisian language. Of all the Germanic dialects this is the one nearest akin to Anglo-Saxon, so that the two tongues are sometimes classed together as Anglo-Saxon Frisian. Thus we have Anglo-Saxon *mōna*, Old Frisian *mōna*, moon, but Old High German *māno*, Gothic *mēna*, or Anglo-Saxon *æcer*, Old Frisian *ekker*, field, acre, but Old High German *achar*, Gothic *akrs*. On the other hand, Frisian has many points of association with Dutch and Icelandic, which are not found in Anglo-Saxon, as *of*, or, *wēr*, true, while the Icelandic and Anglo-Saxon have the so-called 'breaking' of the vowels before *r*, *l* + consonants which does not occur in Frisian, e.g. Anglo-Saxon *beorh*, Icelandic *biarg*, hill, but Old Frisian, Old High German *berg*. It seems probable, on the whole, that the Anglo-Saxons once occupied the land between the Frisians and the Scandinavians, and that of the Anglo-Saxon dialects the Kentish stood nearest the Frisian (e.g. Old East Frisian *biade*, he commanded, Kentish *biade*, but West Saxon *bēode*), while next to the Kentish in this respect came the West Saxon, and finally the Northumbrian and Mercian.

Frisian is divided into numerous dialects, many of which now differ from each other to a surprising degree. Indeed, so divergent are many words in the vocabularies of the various dialects, that some of the commonest terms become unintelligible after a very short distance. It is furthermore necessary to bear in mind the strong influence exercised by Danish over the vocabularies of many dialects. By a phenomenon, somewhat unusual in language, many terms for the most familiar objects are loan-words in Frisian, being borrowed from the Danes.

Frisian may be divided first into East and West Frisian, and the former of these again into East and North Frisian. The East Frisian, using the term in this restricted sense, is subdivided into the Weser and the Ems dialects. This group has been gradually supplanted by Low German (Plattdeutsch), so that what is now often called East Frisian is, in reality, a Low German dialect. In 1890 thirty-two persons on the island of Wangeroog, and about 2000 in the Saterland of Oldenburg still spoke East Frisian. The North Frisian group, which formed the vernacular of about 2600 persons in 1885, is divided into seven dialects on the mainland and three on the islands. The dialects of the coast have been strongly influenced, not only by Low German, but also by Danish, and island dialects seem to show in addition the presence of West Saxon elements. Of Old North Frisian hardly any records exist, the oldest being a short inscription on a font of 1452 at Pelworm. Old West Frisian, on the other hand, is represented by literary remains which are relatively extensive, while the New West Frisian is that in which the bulk of modern Frisian literature is composed. The dialects of New West Frisian are not separated by such wide divergencies as the East and North groups, although they number six, since the majority of the differences are due to the operation of analogy (q.v.).

The Frisian employs the Roman alphabet, but uses *u*, *v*, and *w*, as well as *c* and *k*, almost indiscriminately. The vowels have the Italian values, and the consonants are pronounced in general as in German, excepting that *s* is soft like the English *z*, and that *k* or *c* is frequently palatalized before *e* and *i* to *ch* or *sh* (written *sz, sth, ts, tz, tsz*, or, in West Frisian, simply *s, z*). There is a tendency to elide *r* and *l* (*dega* beside *degar*, days; Modern Frisian *woed, woe*, Anglo-Saxon *wolde*, English *would*). The guttural *g* is often vocalized to *i̯* (*jeld* for *geld*, payment; cf. Anglo-Saxon *geard*, English *yard*). The old pronunciation of *th*, as in English *thorn*, is still retained in some of the island dialects (West Frisian *thank*, thanks, but North Frisian *tōnk*). The sound of *h* was extremely weak. The morphology of Frisian is essentially Germanic in its type. In nouns there are the three genders, two numbers, five cases, and the division into strong and weak declensions. Even in modern North Frisian the pronoun retains the dual (*wat* and *jat*, cf. Anglo-Saxon *wit* and *git*), which has been lost in all other modern Germanic languages. The verbs are strong, weak, and preterite-present, forming their past tenses, as in the other dialects of this group, either by ablaut (q.v.), or by composition with the verb signifying *to do* (e.g. Frisian infinitive *finda*, to find, preterite singular *fand*, preterite plural *fundon*, past participle *funden*, Anglo-Saxon *findan, fand, fundon, funden;* Frisian *hatia*, to hate, preterite *hatade, hatadon*, past participle *hatad;* Anglo-Saxon *hatian, hatade, hatadon, gehatad;* Frisian *mōta*, to be obliged, present singular *mōt*, present plural *mōton*, preterite *mōste*, Anglo-Saxon *mōtan, mōt, mōton, mōste*). The passive is formed like the Germanic passive generally, except in Gothic and the Scandinavian dialects, by *wesa* (Anglo-Saxon *wesan*), to be, with the past participle (e.g. Frisian *ik was funden*, Anglo-Saxon *ic wæs funden*, I was found). The syntax of Frisian follows the general type of the older Germanic languages.

Frisian Literature. Frisian literature is, relatively speaking, extremely scanty. The oldest specimens of Frisian date no further back than the thirteenth century, although it may be shown by references to the ancient Latin chronicles that here, too, the Germanic epics had flourished at least five centuries before. These ancient epics were doubtless alliterative like the Anglo-Saxon and Icelandic poems, but beside the alliteration might be found now and then rhymed verse, as we find it for instance in Old High German in Otfrid's *Evangelienbuch.* As an example of such a verse, which also shows a trace of the older alliteration, we may quote

hē stifte and stērde treuwe and wērde

(he founded and strengthened fidelity and worth). Of this class of literature the most noteworthy is the so-called Privilege of Charlemagne, which purports to confer certain political rights on the Frisians. The production is, however, a forgery of the thirteenth century. It is written in rhythmic prose. The Rudolf-book, claiming to belong to the twelfth century, but probably written two centuries later, is a legendary account of the laws given by one Rudolf to the Frisians, who had been summoned to contribute a levy of troops for service against the Northmen. There is also a collection of 1671 verses edited under the title *Thet freske rÿm*, which is a translation of Low German verses, and composed in a barbarous mixture of dialects which renders it practically useless for the study of the language. The prose literature is much more extensive and important. It begins about the eleventh century with an interlinear translation of the Psalms and with a late Chronicle. The remainder of the prose is devoted to legal topics. These law-books fall into two sections, general and local. To the general codes belong, among others, the seventeen *Keren* (petitions) and the twenty-four *Lōndriuchta* (land-rights). These were originally written in Latin and later translated into the various Frisian dialects. Besides some additions to the Keren, there is also the code of Upstalbōm, dating from 1323. Among the local law-books by far the most important class is formed by the Prologues and Tractates. The Prologues, as the name implies, are introductions to the codes proper, and deal with the history of the land or the dynasty, or treat of the theory and nature of law. Old sagas, too, are found in some Prologues, such as the saga of Karl and Redbad, or that of Magnus. More miscellaneous topics contained in them are descriptions of the Day of Judgment, the Creation, the grades of the priesthood, and the like. The Tractates themselves contain the legal codes. Tax-lists, formulas for taking the oath, letters, and synodical epistles (*sinuthriuchta*) are also found in the prose literature of Old Frisian.

The modern Frisian literature dates from the sixteenth century. Poetry is dead in East Friesland. In 1632 Imel Agena, of Upgant, composed a trivial poem in Alexandrines, which seems to have been a portion of a dance song. In North Friesland poetry was little better developed, although there are a few verses preserved, as well as a number of sagas current on the islands. The only important piece of North Frisian literature is J. P. Hansen's comedy *Di Gidtshals of di Söl'ring Pid'ersdei* (Flensburg, 1809; 2d ed. with the addition of a story, *Di leddelk Stjüürman*, and some poems, Sonderburg, 1833). The most important of the modern Frisian literatures is the West Frisian, which has a continuous line from the sixteenth century to the present time. Between the old and new periods of this dialect there is, therefore, almost no gap, for the last example of Old West Frisian is a law of 1559, and the first specimen of the New is a comic dialogue of 1609, *Een tsamensprekinghe van twee boersche Personen, Wouter en Tialle.* Early in the seventeenth century arose one of the greatest names in Frisian literature, that of Gÿsbert Japiks (1603-66). He was a true poet, turning especially toward peasant life, rich, too, in love poetry, and in the dialogue with which the modern period had begun. He was influenced by Dutch and classical models, but was, nevertheless, unaffected and unpedantic. In his last years, however, he lost his early simplicity. His imitator, Jan Althuysen (1715-63), like Japiks, made a translation of fifty-two Psalms and composed in addition many occasional poems. From the time of Althuysen till the present, no great literary name has arisen among the Frisians. Many brief poems, epithalamia, and the like, have been written, but only comedy deserves any special mention. Full of wit, and turning on the difference between the country and city, these plays portray excellently the peasant life. Most noteworthy are Eelke Meinderts's *It libben fen Aagtje Ijsbrants, of dy frieske boerinne* (1779); *De tankbrē boerzoon* (1778); *De reijs fen Maicke Jakkelis* (1778); and *Het jonge lieuws boosk* (1780).

Of the later Frisian writers, the most noteworthy are the Halbertsma brothers, Joost Hiddes (1782-1869), and Eeltje (1797-1858). The latter was a poet of talent, as is evident from his *Lapekoer fen Gabe Scroar* (1822), and his *Rīmen en Teltsjes* (1868). Among other poets may be mentioned P. C. Salverda (*Ijtlÿcke friesche Rÿmckes*, 1824); Rinse Posthumus, who wrote *Prieuwecke fen friesche Rÿmmelerÿe* (1824), and translated several of Shakespeare's plays, such as *Julius Cæsar* and *The Merchant of Venice.* J. G. van Blom (1796-1871) was a poet of the people, and J. F. van der Wey-Rutgers, H. G. van der Veen, and C. Wielsma wrote of child-life. Waling Dÿkstra (1821—) is the most prolific of contemporary Frisian authors, while the most elegant is probably Pieter Jelles Troelstra (1860—), who is known not only as a lyric poet, but also as one of the editors of the Frisian monthly *For Hûs en Hiem.*

BIBLIOGRAPHY. The most complete account of the Frisian language and literature is found in Siebs, *Geschichte der friesischen Sprache,* in Paul's *Grundriss der germanischen Philologie,* vol. i. (2d ed., Strassburg, 1901), and *Geschichte der friesischen Litteratur,* vol. ii. (ib., 1893), where references to all the literature on the subject are collected. Consult also: Bendsen, *Die nordfriesische Sprache nach der Mohringer Mundart* (Leyden, 1860); Johansen, *Die nordfriesische Sprache nach der Föhringer und Amrumer Mundart* (Kiel, 1862); Winkler, *Algemeen nederduitsch en friesch Dialecticon* (The Hague, 1874); Cummins, *Grammar of the Old Frisian Language* (London, 1887); Colmjon, *Beknopte friesche Spraakkunst vor den tegenwoordigen Tijd* (2d ed., Joure, 1889); Siebs, *Zur Geschichte der englisch-friesischen Sprache* (Halle, 1889); van Helten, *Altostfriesische Grammatik* (Leeuwarden, 1890); Outzen, *Glossarium der nordfriesischen Sprache* (Copenhagen, 1837); Richthofen, *Altfriesisches Wörterbuch* (Göttingen, 1840); Sturenburg, *Ostfriesisches Wörterbuch* (Aurich, 1862); ten Doornkaat Kooman, *Wörterbuch der ostfriesischen Sprache, etymologisch bearbeitet* (3 vols., Norden, 1879-84); Dÿkstra and Hettema, *Friesch Woordenboek* (Leeuwarden, 1896 et seq.); Richthofen, *Friesische Rechtsquellen* (Berlin, 1840); Hettema, *Oude friesche Wetten* (Leeuwarden, 1845-51); id., *Untersuchungen über friesische Rechtsgeschichte* (Berlin, 1880-86); id., *Bloemlezing uit oud-, middel- en nieuwfriesche Geschriften* (Leyden, 1887 et seq.); Siebs, *Sylter Lustspiele* (Griefswald, 1898).

FRIT (Fr. *fritte,* from It. *fritta,* frit, from *friggere,* Lat. *frigere,* to parch). An active greenish-black fly (*Oscinis frit*) of the size of a large flea, which does great injury to barley crops in the north of Europe. It lays its eggs in the flowers, and its larvæ live on the young grains. The family is represented in America by the species Oscinis variabilis and other minute 'grass-stem flies' of the genera Meromyza, Chlorops, etc., which damage various crops. In the Southern States they swarm in clouds at certain seasons and get into the eyes of animals and men, and to them has been attributed the spread of the disease pink-eye (q.v.).

FRITH, or **FRYTH,** JOHN (1503-33). An English Protestant martyr. He was born at Westerham, in Kent, and educated at Eton and Cambridge, where Gardiner, subsequently Bishop of Winchester, was his tutor. Immediately after taking his bachelor's degree (1525), invited by Wolsey, he transferred his residence to the newly founded Cardinal College (now Christ's Church), Oxford. He made the acquaintance of Tyndal, and assisted him in his translation of the New Testament. His zeal in the cause of the Reformation led to his imprisonment at Oxford for some months. At the instance of Wolsey he was released (1528), and fled to the Continent, where he resided chiefly at the newly founded Protestant University of Marburg, and was again associated with Tyndal in literary labors. At Marburg he became acquainted with several scholars and Reformers of note, particularly with Patrick Hamilton (q.v.). His first publication was a translation of Hamilton's *Places,* made shortly after the martyrdom of the author, and soon afterwards appeared *A Pistle to the Christen Reader,* under the pseudonym 'Richarde Brightwell' (1529), and *A Disputacion of Purgatorye,* a treatise against Rastell, Sir Thomas More, and Fisher, Bishop of Rochester (1531). In 1532 he ventured back to England. Warrants for his arrest were almost immediately issued, at the instance of More, then Lord Chancellor. After evading pursuit for some weeks, he fell into the hands of the authorities as he was on the point of making his escape to Flanders. The rigor of his imprisonment in the Tower was abated when Sir Thomas Audley succeded to the chancellorship, and it was understood that both Cromwell and Cranmer were disposed to leniency. But the treacherous circulation of a manuscript, *Lytle Treatise on the Sacraments,* which Frith had written for the information of a friend, with no view to publication, further excited the hostility of his enemies. He was tried and found guilty of denying that the doctrines of purgatory and transubstantiation were necessary articles of faith. June 23, 1533, he was handed over to the secular arm, and was burnt at Smithfield, London, July 4. During his captivity he wrote a controversial work on the eucharist, and several tracts. Frith was the first to maintain the doctrine regarding the sacrament of Christ's body and blood which ultimately came to be incorporated in the English communion office. Twenty-three years after his death as a martyr, Cranmer, who had been one of his judges, went to the stake for the same belief, and three years later it had become the publicly professed faith of the English nation. Frith's works were published by Foxe (London, 1573), and there was another edition in 1631.

FRITH, WALTER. An English dramatic author and critic; the son of the Royal Academician W. Powell Frith. He was born in London, was educated at Harrow and Cambridge, then studied law, and became a barrister in 1880. Among his literary works, besides other publications, are a number of plays which have been produced in London and elsewhere; the list includes: *Brittany Folk* (1889); *The Verger* (1892); *Her Advocate* (1895); *Not Wisely but Too Well* (played by the Kendals in London in

1898); and *The Man of Forty*, his best-known piece, brought out by George Alexander in March, 1900, and reproduced in New York in November of the same year, at Daly's Theatre.

FRITH, William Powell (1819—). An English figure and genre painter. He was born near Ripon, Yorkshire, January 9, 1819. He was a pupil of Sass's noted art school in Bloomsbury, and a student of the Royal Academy. In 1840 he exhibited his "Malvolio Before the Countess Olivia," which attracted much public attention. His "Village Pastor," painted in 1845, made him an associate member of the Academy. For some time he continued to paint in a similar vein, producing his pictures, "The Parting Interview of Leicester and the Countess Amy," "The Coming of Age," "Pope Making Love to Lady Mary Wortley Montague," etc. But it was not until Frith was elected a Royal Academician in 1853 that he took on a new manner in portraying the humorous aspect of an English crowd. His "Life at the Seaside, Ramsgate," was a lively interpretation of a cockney gathering when abroad for a holiday. It was purchased by Queen Victoria. Frith's "Derby Day," painted in 1858, and said to be the picture of the year, in popularity at least, was a vivid representation of this English carnival, and executed with most admirable finish. Frith painted the "Marriage of the Prince of Wales" (1865), a commission from Queen Victoria. Among his later works are the "Railway Station," "The Road to Ruin" (1878), and "Private View of the Royal Academy" (1881). Consult: Frith, *My Autobiography and Reminiscences* (London, 1887); id., *Further Reminiscences* (ib., 1888); Muther, *History of Modern Painting* (New York, 1896).

FRITHJOF'S SAGA, frēt′yôfs sä′gȧ. An ancient Icelandic myth. It was probably first written down at the end of the thirteenth or in the beginning of the fourteenth century, and records the life and adventures of the hero Frithjof (properly *Fridhthjófr*, 'peace-destroyer'), who loved the beautiful Ingeborg, the daughter of a petty king of Norway. After being rejected by the brothers of Ingeborg, and having committed various acts of revenge on his enemies, he comes to the Court of the old King, Hring, to whom Ingeborg has been married, and is received with kindness. At the death of her husband, Ingeborg is married to her lover, who acquires with her hand the dominions of Hring, over which he rules prosperously to the end of his days. Frithjof is supposed to have lived in the eighth century; but some writers assign to him a much earlier period. This saga was included by Björner in his collection *Nordiska Kämpadater* (Stockholm, 1737); and by Rafn in his *Fornaldar Sögur Nordhrlanda* (Copenhagen, 1829). Attention has of late years been more especially drawn to this ancient saga, which is, in fact, merely one of a number of similar mythical narratives, in consequence of the Swedish poet Tegnér (q.v.) having selected it for the groundwork of a poem ("Frithjof's Saga"), which was published in its complete form in 1825, and at once became the most popular poem that had ever appeared in Sweden, and raised its author to the height of his reputation. Tegnér has been justly blamed for giving to his hero qualities that are at utter variance with the conditions under which he lived. While a certain amount of idealization was necessary in order to adapt the story to the demands of modern taste, the poet was not justified in making a sentimental troubadour out of a Norse viking. But in spite of these striking faults the poem possesses lyrical beauties that amply insure it a permanent place in Swedish literature. The "Frithjof's Saga" of Tegnér has been translated into most of the European languages; among the six or seven English translations, we may instance those by Latham (London, 1838) and Stephens (ib., 1841).

FRITIGERN, frĭt′ĭ-gĕrn, or **FRIDIGERN.** A Visigothic chieftain. When, in 376, the Visigoths were crowded from Dacia by the inroads of the victorious Huns, he was permitted by Valens, Emperor of the East, to transport his band, which nominally, at least, was Christian, across the Danube, and to settle it in Mœsia. Quarrels ensued between the immigrants and the Roman officials, and culminated in the battle of Adrianople (August 9, 378). Fritigern, in principal command of the Visigoths, there destroyed fully two-thirds of Valens's army, thus inflicting a defeat, which, for actual loss on the field, was equaled in Roman annals only by the disaster at Cannæ (B.C. 216). Valens himself was killed and his body was never recovered. Fritigern's leadership for a brief time maintained Visigothic unity, which was dissolved immediately after his death.

FRIT′ILLARY (from Lat. *fritillus*, dice-box, from the form of the perianth), *Fritillaria*. A genus of bulbous-rooted plants of the order Liliaceæ, natives of Europe and other temperate regions of the Northern Hemisphere. The drooping perianth, which is bell-shaped, has six distinct segments, each with a conspicuous honey-pore (nectary) at the base. About forty species, some beautiful, are known. One species, the common fritillary, or snake's-head (*Fritillaria meleagris*), a native of Great Britain, blooms in April and May in meadows and pastures in the east and south of England. The stem, about a foot high, bears several linear leaves, and, in general, only one flesh-colored, dark-spotted flower. Many varieties, including the crown imperial (*Fritillaria Imperialis*), a native of Persia and the north of India, are in cultivation. Among the indigenous American species, which have scaly bulbs and are confined to the Pacific coast, the best known are *Fritillaria pudica*, *Fritillaria recurva*, and *Fritillaria camtschatcensis*, sometimes called black lily, which occurs from California to Alaska and in Siberia. In Alaska the bulbs were formerly gathered, dried, and, to a considerable extent, eaten. They are surrounded by many small white bulblets of the size and shape of a grain of popcorn, and are sometimes called wild rice. They have been frequently taken from the crops of birds at considerable distances from where they were grown.

FRITILLARY (Neo-Lat. *fritillaria*, nom. pl., from Lat. *fritillus*, dice-box), or Silverspot. A nymphaline butterfly, of a group mostly the genus Argynnis, with fulvous and black checkered wings. The hind wing is often marked with a row of silvery eye-spots. There are more than fifty species in the United States, whose larvæ feed at night on violets. The great spangled (*Argynnis Cybele*) and the variegated fritillary (*Euptoieta Claudia*) are two common North American representatives.

FRITSCH, frĭch, Anton Johann. See Frič.

FRITSCH, Gustav Theodor (1838—). A German scientist and traveler, born at Kottbus (Brandenburg). He studied at Berlin, Breslau, and Heidelberg; in 1863-66 made a scientific journey to South Africa, and in 1867 became an assistant in the Anatomical Institute at Berlin. In 1868 he was a member of the expedition to Aden to observe the total eclipse of the sun, and in 1847 of the expedition sent to Ispahan, Persia, to observe the transit of Venus. He was appointed in the latter year to the chair of comparative anatomy at the University of Berlin, and subsequently to that of physiology. Under commission from the Royal Academy of Sciences, Berlin, he visited the Mediterranean countries in 1881-82 for the study of electric fishes. His publications include: *Drei Jahre in Südafrika* (1868); *Die Eingeborenen Südafrikas* (1873), anatomical and ethnographical observations; *Untersuchungen über den feinern Bau des Fischgehirns* (1878); and *Die elektrischen Fische* (2 parts, 1886-90).

FRITSCH, Johann (1849—). A German neurologist, born at Tepl, Bohemia. He studied at the University of Vienna, was appointed a lecturer there, and afterwards professor of psychiatry. His publications include: *Ueber die primäre Verrücktheit* (1879), and *Erfahrungen über Simulation geistiger Störung* (1890).

FRITSCH, Karl (1812-79). An Austrian meteorologist, born at Prague. He attended the university there, was for a time a Government official, but privately pursued meteorological investigations, and from 1862 to his retirement in 1872 was vice-director of the Austrian meteorological service. Large increase was made by him in the number of observation stations, and he contributed valuable articles to the publications of the Vienna Academy and of the Oesterreichische Gesellschaft für Meteorologie.

FRITSCH, Karl, Baron (1838—). A German geologist, born at Weimar. He studied at the University of Göttingen, and in 1873 became professor of geology at Halle. His publications include: *Reisebilder von den Kanarischen Inseln* (1867); with Reiz, *Geologische Beschreibung der Insel Tenerife* (1868); and *Allgemeine Geologie* (1888).

FRITZ, frĭts, Der alte (Ger., Old Fritz). A nickname given by the soldiers to Frederick the Great.

FRITZ, John (1822—). An American expert in the manufacture of iron and steel, born at Londonderry, Pa. He was trained as a machinist in small establishments at Parkersburg and Norristown, and afterwards was employed in the construction of rolling-mills. In this connection he made so thorough a study of the details of iron and steel manufacture as to become an authority on the subject, and to be commissioned with the equipment of the Cambria Iron Works and the well-known Bethlehem Iron and Steel Works. For many years he was manager of the latter. He was among the first to introduce the Bessemer process into the United States, and a pioneer in other methods now generally used. In his honor a medal was established by a group of scientists and manufacturers in 1902, to be known by his name and to be awarded in recognition of notable discoveries in industry and science.

FRITZ, Samuel (1653-1728). A German Jesuit missionary, born in Bohemia. He entered the Jesuit Order, and in 1686 became a missionary on the Upper Amazon. Owing to ill health he withdrew to the Portuguese colony of Para, at the mouth of the river, and was held prisoner as spy there until 1691, by the Governor. Having been liberated and having reported to the Viceroy at Lima his various observations, he returned to his missionary field in 1693. During his forty-two years of activity among the Indians he founded the Omaguas missions and others, and prepared the material for his great map of the Amazon. This apeared at Quito in 1707, in the *Lettres édifiantes* (vol. xii.) in 1717, and was for many years the recognized authority on the region included by the river system.

FRITZ, Unser (Ger., Our Fritz). A name given by the Germans to Frederick William, Crown Prince of Prussia, later Emperor Frederick III.

FRITZLAR, frĭts′lär, Herbort and Hermann von. See Herbort and Hermann von Fritzlar.

FRITZNER, frĭts′nĕr, Johann (1812-93). A Norwegian lexicographer, born at Asköe, near Bergen. He was educated at Christiania, and after holding several pastorates devoted himself entirely to scientific labors, as a result of which he published the *Ordbog over det gamle norske Sprog* (2d ed. 1884 et seq.), an excellent dictionary of ancient Norse.

FRITZSCHE, frĭt′she, Adolf Theodor Hermann (1818-78). A German philologist. He was born at Groitzsch, Saxony, and was educated at Leipzig, where, after an activity of several years at the University of Giessen, he occupied the chair of philology from 1850 until his death. Besides original poems in Latin and German, he published valuable editions of several works of the Greek and Roman classics, the most noteworthy being the editions of *Theocritus* (2d ed. 1869), and of the *Satires* of Horace (1875-76).

FRITZSCHE, Christian Friedrich (1776-1850). A German theologian, born at Naundorf. He was educated at Leipzig, and was professor of theology at Halle from 1830 until his death. During a great part of this time he acted as censor for theological publications. Besides numerous articles published as *Fritzschiorum Opuscula Academica* (1838), he wrote *De Anamartesia Jesu Christi* (1835-37), and several minor works.

FRITZSCHE, Franz Volkmar (1806-87). A German classical scholar, son of Christian Friedrich Fritzsche. He was born at Steinbach, in Saxony, and after studying under Beck and Hermann at the University of Leipzig, was professor of eloquence and poetry at Rostock from 1828 until his death. His works deal chiefly with Lucian and the Greek dramatists, particularly Aristophanes. Among the most important are the *Quæstiones Lucianeæ* (1826); an edition of the *Dialogi Deorum* (1829); and of Aristophanes's *Thesmophoriazusæ* (with a commentary, 1838) and *Ranæ* (1845); and a critical edition of Lucian's complete works (1860-74). In defense of his old teacher, Hermann, he published *Recension des Buches Æschylos Eumeniden von K. O. Müller* (1834).

FRITZSCHE, Karl Friedrich August (1801-46). A German theologian, the eldest son of Christian Friedrich Fritzsche. He studied under his father and subsequently attended the University of Leipzig. After holding a professorship at that institution for one year, he was successively appointed to the chair of theology at Rostock (1826-41), and Giessen (1841-46). His philological interpretations of biblical texts are considered accurate, and in the defense of his views he revealed himself a skillful controversialist. His principal works are the *Commentaries on Matthew* (1826); *Mark* (1830); and the *Epistle to the Romans* (1836-43).

FRITZSCHE, Otto Fridolin (1812-96). A German theologian, son of Christian Friedrich Fritzsche, born at Dobrilugk, southwest of Frankfort; he studied at Halle, became professor extraordinary at Zurich, 1837; full professor, 1842; and also chief librarian at the cantonal library in 1844. He published a critical edition of Lactantius (1842-44); *The Life and Writings of Theodore of Mopsuestia* (1836), and his *Exegetical Fragments* (1847); Anselm's *Cur Deus Homo?* (1868); and other works. He is best known by his work on the Old Testament *Apocrypha and Pseudepigrapha* (6 vols., 1851-60).

FRIULI, frė-o͞o′lė (Lat. *Forum Julii*). The name of a district on the north and northeast shores of the Adriatic Sea, now forming the Province of Udine, Italy, and the Austrian coast districts of Görz and Gradisca (Map: Italy, G 1). Friuli was anciently one of the thirty-six duchies into which the Longobards divided the north of Italy. It was from an early period divided into Tyrolese and Venetian Friuli, the former of which came into the possession of Austria in 1500, while the latter remained attached to Venice till the Peace of Campo-Formio (1797), when it also was given to Austria. Venetian Friuli finally came into the possession of Italy in 1866. The inhabitants, called Furlani, are for the most part Italian, but speak a peculiar dialect.

FRIULI, Duke of. See Duroc, Gérard Christophe Michel.

FRIZZLE. A breed of fowls, so called from the strangely curled ends of the feathers, especially those of the neck and back. They are bred largely for their grotesque appearance, but are hardy and useful.

FRÖBEL, frẽ′bel, Friedrich Wilhelm August (1782-1852). A German educationist, the famous promoter of what is known as the kindergarten movement. He was born at Oberweissbach, in Thuringia, April 21, 1782, where his father was a pastor of the old Lutheran Church. As his mother died while her son was an infant, the boyhood of the future friend of children was lonely, and his father's second marriage did not increase the happiness of the child. He became strongly introspective, and the severity of the religious influences under which he was trained placed him in a morbid attitude toward life, both the present and the future, a disposition which he overcame in his majority. At the age of ten years, he was sent to his uncle in the town of Ilm, where a happier life began. When fifteen he was apprenticed to a forester, and his duties were such that while he added to his knowledge of the outer world, he could devote himself (as he says) "in many various ways to self-education, self-instruction, and moral advancement. Especially did I love to indulge my old habit of self-observation and introspection."

In 1789, when the days of his apprenticeship were over, he went to Jena, and for several months came under the influence of the university, where his brother had been enrolled as a student of medicine. His studies were irregular and unfruitful, and at length, after confinement for several weeks in the 'carcer,' because he had not money to pay his bills, he withdrew from the university and secured employment in the Office of Woods and Forests, in the Territory of Bamberg. He was then brought again into close companionship with Nature, for his calling required him to live out of doors in a region of lovely scenery. After a short service of this kind, he was engaged as a surveyor in the service of the Bavarian Government, and later he became manager of a private estate. Having inherited a little property at the death of an uncle, he determined to become an architect, and for this purpose went to Frankfort-on-the-Main. Gruner, the master of the Frankfort Model School, then said to him: "Give up architecture. It is not your vocation at all. Become a teacher. We want a teacher in our own school. Say you will agree, and the place shall be yours." The young man accepted, and thus began his educational career. Gruner had been a pupil of Pestalozzi, whose name was the watchword of the Frankfort School. "It soon became evident to me," says Fröbel, "that Pestalozzi was to be also the watchword of my life." So Fröbel went to Yverdon and remained, for a fortnight, on a visit to the great educational reformer, whom he greatly admired, but whose methods he did not wholly approve. Uncertainty as to his calling, due perhaps to fickleness, perhaps to versatility, perhaps to genius, still embarrassed him. Several openings came to him, but none attracted him. So he returned to Pestalozzi and remained many months at Yverdon, where he wrote out an account of the work there in progress. His career continued uncertain, and he tried once more the environment of university life, first at Göttingen, and then at Berlin, where he showed such proficiency in mineralogy that his professor, Dr. Weiss, gave him an assistant's post in the mineralogical museum. War interrupted this service. In 1813 he joined Lützow's famous troop and saw some active service, and again in 1815 he enlisted as a volunteer. At the close of the war he determined to devote himself to the promotion of education. A curious passage in his autobiography declares that in the mineralogical laboratory "the stones in my hand turn to living, speaking forms. The crystal-world, in symbolic fashion, bore unimpeachable witness to me, through its brilliant unvarying shapes, of life and of the laws of human life, and spoke to me with silent yet true and readable speech of the real life of the world of mankind."

His approaching marriage (in 1818) may have had some influence in concentrating his mind upon the purpose of life, for he founded in 1816 a school at Greisheim (afterwards removed to Keilhau), called 'the Universal German Educational Institute,' and in it he proceeded to develop his plans. Up to this time all the events of his life had been preparatory. He was now thirty-six years old, his life half gone. During the next thirty-four years his work was accomplished.

Eight years later he published his most important book, a volume entitled *Menschenerziehung* (Education of Man), which is a sort of cornerstone in his philosophy of education. Notwithstanding its comprehensive title, it really discusses the education of a child. The Institute awakened suspicion, and finally opposition, on the part of conservative governments, and the Prince of Schwarzburg-Rudolstadt caused an official inspection of it to be made. The report, on the whole, was favorable. Fröbel's attention was now called by Krause (a well-known philosopher, whose acquaintance he had made) to the writings of Comenius, and from them he received a fresh impulse toward the development of his educational plans. After unsuccessful attempts to establish his Institute at Helba, near Meiningen, and afterwards near Lucerne, at Willisau, the Bernese Government invited Fröbel to consider a plan for founding an orphanage at Burgdorf. To this place he removed in 1835, and success followed the change. It is said that he considered, at this time, a visit to the United States in order to establish his system in a new country. He was now committed fully to the doctrine that the education of the nursery must be reformed, and the need of training for mothers became more and more evident to him. After a short stay in Switzerland, he went to Berlin in 1836, returned to Keilhau, and then established himself in Blankenburg, a small town not far from Keilhau. Langethal, Middendorf, and Barop were his serviceable assistants. About this time he hit upon the name 'kindergarten,' which has since been introduced into many lands and many tongues—a much better term than one originally employed by Fröbel—'Anstalt für Kleinkinderpflege' (an institution for the care of little children). His friend Barop tells this story: "Middendorf and I were one day walking to Blankenburg with him over the Steiger Pass. He kept on repeating, 'Oh, if I could only think of a good name for my youngest born!' Blankenburg lay at our feet, and he walked moodily toward it. Suddenly he stood still as if riveted to the spot, and his eyes grew wonderfully bright. Then he shouted to the mountain so that it echoed to the four winds, 'Eureka! Kindergarten shall the institute be called!'"

Embarrassments still beset him. His ideas were not generally accepted; he lacked money for the maintenance of his school; his publications were not remunerative; more than this, his nephew, Carl Fröbel, a professor at Zurich, became the loud advocate of measures which were radical, if not revolutionary, and Frederick Fröbel was accredited with his nephew's opinions. In 1851 Von Raumer, Minister of Education and Public Worship, forbade the foundation of kindergartens in Prussia, and the edict remained in force until 1860, long after Fröbel's death. After 1850 Fröbel made his home in Marienthal, where the Grand Duke of Weimar gave him the use of a country seat. Here he was aided in his school by Luise Levin, who in 1851 became his second wife, and by Alwine Middendorf, who married Dr. W. Lange, the future editor of his writings. His death occurred June 21, 1852. The school at Marienthal was then removed again to Keilhau.

Fröbel's literary style was not good, and his works were never popular; but his thoughts arrested the attention of able and influential people, and by these interpreters and followers kindergarten methods have been introduced into many countries. "Let childhood ripen the children," says H. C. Bowen, "is the keynote of the new gospel." "It is what he did for the education of children between the ages of three and seven that chiefly demands our gratitude." As a statement of his principles, the summary given by H. C. Bowen is adequate: "The main principles, it will be remembered, whose applications form Fröbel's system, are: self-activity, to produce development; all-sided connectedness and unbroken continuity, to help the right acquisition of knowledge; creativeness or expressive activity, to produce assimilation of knowledge, growth or power, and acquisition of skill; well-ordered physical activity, to develop the physical body and its powers; and happy and harmonious surroundings, to foster and help all these." (*Fröbel and Education by Self-Activity*, pp. 180-81.)

The principal writings of Fröbel have been collected in three volumes by W. Lange (Berlin, 1862), and by Friedrich Seidel (Vienna, 1883). Among them the most important is the *Education of Man*, which appeared in 1826. It has been translated into French and into English. The *Mütter- und Kose-Lieder* (Mother's Songs, Games, and Stories) has had many translators. The autobiographies were translated by H. K. Moore and Emilie Michaelis, and in part also by Miss Lucy Wheelock (new ed. London, 1899).

In addition to his own writings, materials pertaining to the life and influence of Fröbel are abundant, and are enumerated in bibliographies that are readily accessible. A selection is not easy. Dr. Barnard's collection of *Papers on Froebel's Kindergarten* (Hartford, 1881) is comprehensive and important. There are two English translations of *The Education of Man*, one by Miss Josephine Jarvis (New York, 1885) and the other by W. N. Hailman (ib., 1887). The *Mother Play* (ib., 1895)), in two volumes, was translated by Miss Susan E. Blow, who has also written a book on *Symbolic Education* (ib., 1894), a commentary on the first five songs of the *Mother Play*, and a volume entitled *Letters to a Mother* (ib., 1900).

Among the estimates of Fröbel's work, these citations may be made. Henry Barnard declared the kindergarten to be by far the most original, attractive, and philosophical form of infant development the world has yet seen. Dr. James Ward holds that the kindergarten system, in the hands of one who understands it, produces admirable results, but is apt to be too mechanical and formal. F. W. Parker says that the kindergarten is the most important, far-reaching educational reform of the nineteenth century. Mr. Quick in his *Educational Reformers* (New York, 1890), from which these words are taken, concludes his estimate by saying that among those who have contributed to the science of education there are probably no greater names than those of Pestalozzi and Fröbel. The memoir by H. Courthope Bowen in the Great Educators Series, edited by Nicholas Murray Butler (New York, 1897), is an admirable study of Fröbel's principles. The fullest biography is that by A. B. Hanschmann. A short memoir was written by Miss Emily Shirreff. Of the last four years of

Fröbel's life there are delightful reminiscences by an accomplished enthusiast, the Baroness von Marenholtz-Bülow, translated by Mrs. Horace Mann (Boston, 1887). Two autobiographical fragments (a letter to the Duke of Meiningen, and a letter to the philosopher Krause), which narrate the perplexities and obstacles of his early life, are contained in a volume entitled *Autobiography of Fröbel* (Syracuse, 1889). It also includes a convenient bibliography. See KINDERGARTEN; PEDAGOGY; PSYCHOLOGY.

FRÖBEL, JULIUS (1805-93). A German writer and politician, nephew of Friedrich Fröbel. After studying at Munich, Weimar, and Berlin, he went to Switzerland, and in 1833 became professor of mineralogy in the university of Zurich. In the interests of the extreme Radical Party, he edited *Der schweizerische Republikaner.* In 1844 he established a publishing house at Zurich, and issued several scientific works and many political pamphlets. Some of his works were suppressed by the Government. In 1846 he took up his residence in Dresden, until the Revolution of 1848, when he became a leader of the Democrats and a member of the National Assembly at Frankfort-on-the-Main. He accompanied Robert Blum to Vienna, and was arrested and sentenced to death, but was pardoned by Windischgrätz. After the dissolution of the Parliament he came to the United States; edited a German paper in New York; went, in 1850, to Nicaragua, and afterwards engaged in one or two commercial expeditions to Santa Fé and Chihuahua. In 1855 he edited a journal in San Francisco, and in 1857 returned to Germany. From 1862 to 1873 he edited newspapers in Vienna and Munich. He was German consul at Smyrna from 1873 to 1876, and at Algiers from 1876 to 1889. He retired from active life in 1890. His works include: *Aus Amerika* (1857-58), translated by himself in 1859 under the title of *Seven Years' Travel in Central America, Northern Mexico, and the Far West; Die Wirtschaft des Menschengeschlechts* (1870-76); and *Ein Lebenslauf* (1890-91), his autobiography.

FROBEN, frō'ben, or **FROBE'NIUS,** JOANNES (1460-1527). A German scholar and printer. He was born at Hammelburg; was educated at the University of Basel, and established in Basel, in 1491, a printing press, at which the art of printing was first brought to a high degree of excellence in Germany. An intimate friend of Erasmus, he not only printed the latter's writings, but had his help in the editions that he printed of Saint Jerome, Saint Cyprian, Tertullian, Hillary of Poictiers, and Saint Ambrose. He did not live to carry out his project of editing the Greek Fathers, but it was creditably done by his son Jerome and his son-in-law, Nikolaus Episcopius. See ERASMUS.

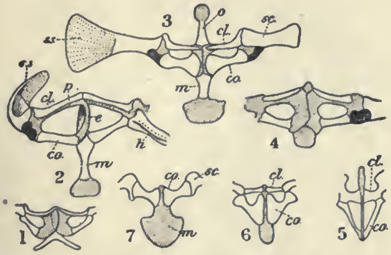
FROBERGER, frō'bĕr-gĕr, JOHANN JAKOB (c.1605-67). A German organist, born probably at Halle. When very young he entered the Imperial choir in Vienna, in 1637 was Court organist there, and the same year went to Rome to study under Frescobaldi. He was again Court organist, 1641-45 and 1653-57, in Vienna, and then made a series of concert tours, appearing with great success in London and Paris. Froberger is a most important figure in the history of organ music, combining German power of expression with Italian nicety of form, but his numerous compositions are now seldom heard. He died at Héricourt, France.

FRO'BISHER, Sir MARTIN (1535?-94). An English navigator and the first of his nation to seek a northwest passage to China. He was born either at Doncaster or Altofts, in Yorkshire, and belonged to a family which came originally from Wales. His early years were spent in voyages to the coast of North Africa, and to the Levant. In 1575, at the instigation of Elizabeth, he received a license from the Muscovy Company to search for the Northwest Passage. With two vessels of 25 tons each and a pinnace of 10 tons, he sailed north in 1576, sighted the southern point of Greenland, which he took to be the Friesland of the brothers Zeni, and came a few days later to a cape he named Queen Elizabeth's Foreland, near the southeast end of Frobisher Bay, which he supposed to be a strait. After a fortnight's exploration of the coasts and islands, he returned to England, bringing with him ore picked up on one of the islands he discovered. The prospect of unlimited wealth aroused the attention of the merchant adventurers of the time. A second expedition, better equipped than the first, was fitted out and the command was given to Frobisher. He sailed in May, 1577, but his activity was chiefly confined to hunting for gold, and his discoveries, which were comparatively trifling, were restricted to the locality which he had previously visited. A third expedition, with fifteen ships, was sent out in the year following with no other result than the discovery of a new strait, which was not explored until the time of Henry Hudson. Frobisher afterwards served under Drake in the West Indies; and was knighted for distinguished service in the fight with the Spanish Armada (1588). In the spring of 1591 he was sent by Sir Walter Raleigh with a squadron to ravage the Spanish coast, and hold the attention of the Spanish fleet while efforts were made to intercept the merchant vessels laden with bullion on their way from Panama. He died on November 7, 1594, from the effects of a wound received while leading an attack by sea against Brest, then in the hands of the Spaniards. The narrative of Frobisher's three voyages may be found in the Hakluyt Society Publications for 1867. For an account of his life, consult Jones (London, 1878).

FROBISHER BAY. An inlet of Davis Strait, in North America, opening westward between Hudson Strait and Cumberland Peninsula, into the territory called the Frobisher Meta Incognita, at the southern end of Baffin Land (Map: North America, M 3). It is about 200 miles long and above 20 wide, with rugged mountainous shores. It was till Hall's voyage called Frobisher Strait, being erroneously regarded as a passage into Hudson Bay.

FROG (AS. *frogga*, Icel. *froskr*, OHG. *frosc*, Ger. *Frosch;* ultimately connected with OHG. *frō*, Ger. *froh*, joyous, Skt. *pru*, to jump). Any member of the Ranidæ, a family of tailless Amphibia, of the group Firmisternia (q.v.), i.e. the two halves of the shoulder-girdle meet and are firmly united in the median ventral line, so that the chest cannot be expanded; and in this family, as distinctive from other Firmisternia, the sacral diapophyses are cylindrical. The young, known as 'tadpoles,' live in the water, have fringe-like external gills, which disappear while they are still young, are without legs, and have a tail provided with a membranous swimming-fin.

The family Ranidæ is divided into three subfamilies, according to the arrangement of the teeth: (1) *Ceratobatrachiinæ*, with teeth in both jaws. This is represented alone by the great horned, tree-climbing frog (*Ceratobatrachus Guentheri*) of the Solomon Islands, which is remarkable chiefly for its extraordinary adaptation in color and appearance generally to its customary surroundings, giving it entire concealment from ordinary observation. (2) *Raninæ*, with teeth (vomerine) in the upper but none in the lower jaws. This is the group of true frogs, regarded as a family by most authors previous to 1901, and typified by the genus Rana, which contains about 140 species. (3) *Dendrobatinæ*, an aberrant group of South American and African frogs, with no teeth at all. They are small and usually brightly colored, and take remarkable care of their young, the mother allowing the tadpoles to fasten themselves by a secretion to her back when their native puddle dries, and thus carrying them to a safer place. One Brazilian species (*Dendrobates tinctorius*) furnishes from its skin the poisonous secretion used by bird-fanciers to change the color of the plumage of the Amazon green parrots.



TYPES OF SHOULDER-GIRDLE.

1, 2, Arciferous (Bombinator and Bufo); 3-7, Firmisternal types (3, adult Rana ; 4, young Rana, showing change from arciferous to firmisternal type with advancing age; 5, Himisus; 6, Breviceps; 7, Cacopus). Cartilaginous parts are dotted; ossified parts are left white. Lettering: *cl*, clavicle; *co*, coracoid; *e*, epicoracoidal cartilage, *h*, humerus; *m*, metasternum; *o*, omosternum; *p*, precoracoid; *sc*, scapula; *ss*, suprascapula.

FROG CARRYING TADPOLES.

There are about 270 species of Ranidæ, which are distributed over nearly all parts of the world except Australia; but there are very few species in South America, and these only in the northern part. In the United States the family is well represented by thirteen species of the genus Rana. Of these the bullfrog (*Rana Catesbiana*), so named on account of its bellowing note, is perhaps our most widely known, as it is our most characteristic frog. It is very large, attaining a length of eight inches, loves the shore, and is green with olive and dusky blotches. (See BULLFROG.) It is equaled in size only by an East Indian species (*Rana tigrina*), and by one in the Solomon Islands (*Rana Guppyi*). The leopard-frog (q.v.) or shad-frog (*Rana virescens*) is green or often brassy-colored, with two rows of black, white-edged blotches on the back. It is the commonest North American Rana. The wood-frog (*Rana silvatica*) (q.v.) is small and reddish brown, with a dark band on each side of the head; it is the most silent frog of the genus, and avoids water except at the breeding season, and its brown color well conceals it among the fallen forest leaves. The green spring-frog (*Rana clamitans*) (q.v.) inhabits cold springs. It is brown or green above and white below, and may be readily distinguished by the very large ear-drums. Like most aquatic animals, frogs can change slightly the color of the skin, depending on external conditions. Two species of Rana are common in Europe, viz. *Rana esculenta* and *Rana temporia*. The latter alone is indigenous to Great Britain, and varieties of it extend throughout temperate Europe and Asia to Japan, and one (variety *pretiosa*) exists in the Western United States. The edible frog (*Rana esculenta*), however, has been introduced into England. An Indian species (*Rana breviceps*) and several South African species burrow in the ground.

Besides the true frogs, several other families, such as the spadefoots (Pelobatidæ), the tree-frogs (Hylidæ), and the piping frogs (Hylodes), are often so called. These show structural affinities which bring them as near to the toads as to the frogs, and are described elsewhere under their separate names.

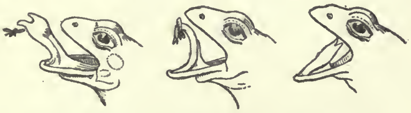
ECOLOGY AND HABITS. The skin of frogs is usually smooth and free from warts or horny excrescences. It is invested with a colorless epidermis, which is shed from time to time as the creature grows; this splits along the back and thighs, is worked over the head like the taking off of a shirt, and usually eaten by the wearer. The deeper layers contain much pigment, in cells which are more or less under muscular control, enabling frogs to change their hue to conform to the background. (For further information on this point, see METACHROSIS; TREE-FROG.) The skin also secretes in numerous glands a viscid, milky fluid, which is of poisonous character—in some species very decided—and is their only defensive property. That obtained from a South American frog is said to be used as an arrow-poison by the Amazonian Indians. In a rare East Indian form, the arboreal flying frog (q.v.), the skin spreads into broad webs between the greatly extended toes, enabling the animal to make long sailing leaps, analogous to those of the flying squirrel. All frogs move on land by leaps, which are often of surprising vigor and extent.

Frogs are carnivorous, and in the season of activity are likely to be very voracious. The terrestrial and arboreal forms feed mainly on insects, worms, etc. The aquatic kinds also catch insects, but subsist more on aquatic animals—worms, tadpoles, small fishes, and other frogs. These are seized and slowly swallowed, often, where the prey is large, so slowly that the engulfed parts will be digested before the remainder, perhaps still alive, has been got within the mouth.

Extremes of cold or drought in climate must be avoided by frogs. Moisture of the skin is necessary to their health, and in very dry places or seasons they survive only by going deeply under ground. Thus some tropical species get through the 'dry season.' The frogs of northern climates endure the winter by clustering about spring-holes and other places where the water is comparatively warm and free of ice; or else by hibernating in the mud. Terrestrial species bury themselves for the winter in the loam, or burrow into the dry dust of rotting logs and stumps. Their vitality is strong, and their power of regeneration from partial congelation is very great.

Though most species live always in or near water, many spend the greater part of their time away from it, and often in bushes or trees. These, however, go to the water to breed; and as this function is likely to demand attention early in the spring, it is then that these animals make themselves most conspicuous by the incessantly uttered croaking or rattling calls of the males, which are almost as varied as the songs of the birds, and more ventriloquistic. These are wholly the cries of the male frogs, and cease when the mates have been found and have spawned; and to assist in producing them many species have gular air-sacs, which are connected with the vocal organs and furnish the power required for the loud and insistent utterances. The great eardrums correlated with this vocal power are conspicuous in many species.

The reproductive habits of frogs are various. All of our common species lay their eggs in water, the eggs being fertilized as they are laid. As the eggs are laid they are inclosed in a gelatinous envelope secreted by the female. This swells and protects the eggs from injury, from being fed upon, from the direct rays of the sun, and in some species it serves to float the eggs at the surface of the water, where oxygen is most abundant; finally, the envelope serves as food for the young frog. The mouth of the tadpole is small and provided with a horny beak, which takes the place of the teeth which are not yet developed. The tadpole feeds on algæ that cover stones, and on the flesh of dead animals. The long, spirally coiled intestine, which can be seen on the under side of the animal, is an adaptation to its prevailingly herbivorous diet, which requires a prolonged digestion.

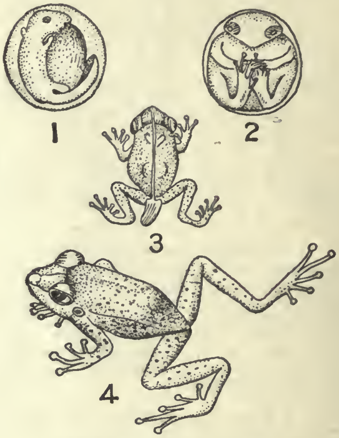


ACTION OF FROG'S TONGUE IN CATCHING A FLY.

The tadpole usually lives in the water for two or three months before it takes to land. In the bullfrog, however, the transformation (see TOAD) does not take place until the second summer.

In many tropical frogs the reproductive habits are much modified. One species (*Phyllobates trinitatis*) of Venezuela and Trinidad carries its tadpoles on its back, to which the young attach themselves by means of their suckers. A frog of the Seychelles Islands lives in the tree-ferns far from water, and carries its young about on its back, to which they are attached by their bellies. In the Kameruns lives a frog that lays its eggs in a foamy mass on the leaves of a tree. When the larvæ are developed the mass becomes slimy and the tadpoles swim about it, and when a heavy rain falls they are washed into pools of water lying at the bases of the trees. The foam is probably produced as it is in culinary operations, by air being entangled in it by a beating that the frog gives the jelly with its feet. The inclosed air may well serve in respiration. Compare TOAD.

UTILITIES. Among both civilized and savage men frogs are a culinary dainty. The edible European frog is so much prized in France that it is bred for the market in large preserves. In the United States both the bullfrog and spring frog are sold in the markets. In France and the United States the hind legs alone are eaten; they are known as 'saddles' to American marketmen, and are usually served at table fried. In Germany all the muscular parts are served stewed, often with sauce. Frogs have enabled man to contribute much to his knowledge of physiology. The tail of the tadpole, so frequently fed on by dragon-fly larvæ and other aquatic enemies, has great capacity of regeneration. The study of its re-formation has added to our knowledge of the regeneration of animal tissue. The circulation of the blood, so readily seen by the aid of the miscroscope in the web of the frog's foot, is a classic and painless class-room demonstration. Observations on the response of frog-muscle to stimuli led the great Italian physiologist Galvani to the discovery of dynamical or current electricity, known to us as galvanic or voltaic electricity. See TREE-FROG; "Factors of Evolution," in article EVOLUTION.



DEVELOPMENT OF HYLODES.

Life History of *Hylodes Martinicensis:* 1. An egg with embryo about seven days old. 2. Embryo twelve days old. 3. Young frog just hatched. 4. Adult male, natural size.

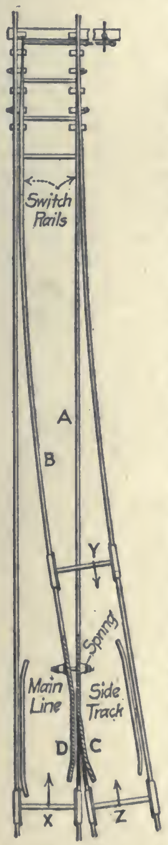
FOSSIL FORMS. Fossil frogs and toads have been found in the Eocene phosphate deposits of Southwestern France, and they seem to be identical with or very closely allied to the modern genera Rana and Bufo. The Miocene deposits of Germany, France, and Bohemia have also furnished fossil frogs and toads. The genus Palæobatrachus of the Oligocene lignites has been obtained in large numbers in both the larval tadpole stage and the adult tailless condition. Tailed batrachians, Stegocephalia (q.v.), were common members of the late Paleozoic and Mesozoic faunas. The stories of living frogs and toads being found in the middle of freshly broken blocks of stone, so commonly told in various parts of the country, are scarcely worthy of credence. They have originated either in deliberate falsehoods or in misapprehension on the part of the original observer.

Bibliography. Boulenger, *Catalogue of British Gradientia* (London, 1882), and many papers in the *Proceedings of the Zoölogical Society of London;* Cope, *Standard Natural History*, vol. iii. (Boston, 1885); Cope, *Batrachia of North America* (Smithsonian Institution, Washington, 1889); Gadow, *Amphibia and Reptiles* (London, 1901). The last (vol. viii. of the *Cambridge Natural History*) is the most recent and comprehensive work on the subject, both systematically and descriptively. For structure and dissection, consult Mivart, *The Common Frog* (London, 1874); Marshall, *The Frog: An Introduction to Anatomy, Histology, and Embryology* (6th ed., New York, 1896). For fossil forms, consult: Wölterstorff, "Ueber fossile Frösche, insbensondere Palæobatrachus," *Jahresberichte der Naturwissenschaftliche Verein von Magdeburg* (1885-86).

See Colored Plate of American Frogs and Toads, accompanying the article Toad.

FROG. See Horse; Horse-Shoeing.

FROG, Railway. A built-up or cast framework of metal placed in railway tracks at switching points to enable the flanged wheels of the cars and locomotives to pass freely from the main track to the side track, or in the reverse direction. Frogs are known as rigid frogs and as spring-rail frogs. In first-class main tracks the spring-rail frog is now almost universally used. The principle of the spring-rail frog is explained by the accompanying diagram. In this diagram the rails A and B, leading to the frog, are the 'lead' rails. The turn-out 'wing rail' C is hinged and held in position by the spring; the main-track 'wing rail' D is fixed or rigid. In passing onto or out of the side track, the wheels Y or Z force back the spring-wing rail C by the wheel flanges entering between the wing rail and the frog-point. A car on the main track passes through the frog on a continuous rail, formed by the main rail, the frog-point, and the spring-wing rail, as indicated by the diagram. In a rigid frog the wing rail C is rigidly fastened away from the frog-point exactly the same as is the wing rail D, so as to have an open flangeway at all times. In a rigid frog there is a break in the main-track rails due to the open flangeway between the wing rail C and the frog-point, while in a spring-rail frog there is no such break, due to the fact that the wing rail C is hinged and is held by a spring close against the frog-point. The early railway frogs were rigid frogs, and were made of cast iron. Frogs, whether rigid or spring rail, are now almost universally made of steel rails planed to shape, and held in the proper relation to each other by means of a base plate, bolts, and clamps. For a concise technical description and discussion of frogs, consult Tratman, *Railway Track and Track Work* (New York, 1900).



FROG, Nicholas, or Nic. A national nickname for the Dutch. It first occurs in Arbuthnot's *Law is a Bottomless Pit.*

FROGBIT. A popular name of certain water plants of the order Hydrocharidaceæ. See Anacharis; Vallisneria.

FROGFISH. One of a family of fishes (Antennariidæ), allied to the anglers. They are remarkable for excessive ugliness. The head is larger than the body, flattened, and spiny; the mouth is very large, with many teeth; the lips are often furnished with filaments; the pectoral fins are supported by a short stalk or wrist. The skin is naked in some species, scaly in others. The species are numerous and widely distributed, and many inhabit the deep sea. They hide themselves in the sand to surprise their prey. Compare Angler, and see Plate of Anglers and Batfish.

FROGHOPPER. See Froth-Fly.

FROGMORE. A royal palace and mausoleum in Windsor Park, Berkshire, England (Map: England, C 6). The palace, purchased in 1800 by Queen Charlotte, was the residence of Queen Victoria's mother, and of Edward VII. when Prince of Wales. The handsome mausoleum of Romanesque architecture, erected in memory of Prince Albert, contains the remains of the Prince Consort and Queen Victoria.

FROGMOUTH. One of a group of large birds of the East Indian and Australian region, constituting a subfamily, the Podarginæ, of the nightjar family, Caprimulgidæ. They are noted for the very wide mouth, especially in the birds of the genus Batrachostomus, which is capable of completely engulfing small birds. They have a soft plumage, and are largely nocturnal like the owls. They have no oil-gland, but possess a pair of large powder-down patches, one on each side of the rump. One of the best-known species is the Australian 'more-pork' (q.v.). See Plate of Nightjars, Oilbird, etc.

FROGS, The. One of the most brilliant of the comedies of Aristophanes, which obtained the first prize on its representation in b.c. 405. The subject of the play is the decay of tragic art, for which Euripides, who had recently died, is attacked.

FROG-SHELL. A small gastropod mollusk of the genus Ranella, closely related to the tritons (family Tritonidæ), so called because of a fancied resemblance of its rough, flattened form and mottled colors to a frog. There are many species in tropical waters, all of which feed upon decaying matter and are useful scavengers. See Colored Plate of Marine Gastropods.

FROGS' LEGS (food value). See Fish.

FROG-SNAKE. See Mattipi.

FROG-SPAWN. The popular name of certain fresh-water algæ which make green and slimy masses on the surface of ponds and sluggish streams. The name is applied properly to the gelatinous mass inclosing the ova of frogs. See Algæ; Frog.

FROG-SPITTLE (so called because formerly believed to be the spittle of frogs). A frothy substance appearing on weeds, grasses, etc., and produced in self-protection by the nymphs of certain plant-bugs, called frog-hoppers. In England the substance is called cuckoo-spit.

FRÖHLICH, frē̆′lĭk, Abraham Emanuel (1796-1865). A Swiss poet, born at Brugg. From 1835 until his death he was pastor at Aarau. His poems and fables are very popular, and the fables rank high among literature of that variety. His works include: *Fabeln* (1825); *Das Evangelium Saint Johannis in Liedern* (1830); *Elegien an Wieg und Sarg* (1835); the epics *Ulrich Zwingli* (1840) and *Ulrich von Hutten* (1845). His collected works were published in 1853.

FROH′MAN, Charles (1858—). An American theatrical manager, one of the leaders of what is commonly called the 'Theatrical Trust,' of which he is the producing partner. He was born in Sandusky, Ohio, and before he was twenty years old became advance agent for a traveling minstrel show. After having become an independent manager of various companies 'on the road,' he established himself in 1893 at the Empire Theatre, New York, and in the season of 1895-96 formed with several managerial firms the 'syndicate,' which has gradually strengthened its position till in many parts of the country it has a practical monopoly of playhouses. He has brought out as stars Maude Adams, Julia Marlowe, John Drew, and other well-known actors.

FROHMAN, Daniel (1853—). An American theatrical manager, born in Sandusky, Ohio. In his youth he was employed in newspaper work in New York, but he early embarked in theatrical management with traveling companies. He has managed the Fifth Avenue and Madison Square theatres (previous to 1885), and more recently the Lyceum and Daly's Theatre, besides the Daniel Frohman Stock Company and various special attractions. He is in close relations with the so-called 'Theatrical Trust,' formed by his brother Charles Frohman.

FROHSCHAMMER, frō′shȧm-ẽr, Jakob (1821-93). A German theologian and philosopher, born at Illkofen, near Ratisbon, and educated at Munich. For more than forty years he was associated with the University of Munich, where he occupied the chair of philosophy from 1855 until his death. Because of his radical utterances on theology he incurred the opposition of the Vatican, and was compelled to resign his position as preacher at the university in 1855. A large number of his writings were directed against the authority of the Church in matters of science, the freedom of which he defended in the work entitled *Ueber die Freiheit der Wissenschaft,* in which in some respects the keynote of the *Kulturkampf* which agitated Germany during the seventies was already sounded. The dogma of infallibility was attacked by him with equal vigor in a number of publications, which involved him in a long and bitter controversy with Catholic theologians. In his philosophical writings he defends the idealistic conception of the universe—a conception possible through a central principle which he defines as 'fantasy.' This idea is carried out in several important publications, of which the following may here be cited: *Monaden und Weltphantasie* (1879); *Die Philosophie als Idealwissenschaft und System* (1884); *Ueber das Mysterium Magnum des Daseins* (1891).

FROHSDORF, frôs′dôrf, or **FROSCHDORF,** frôsh′dôrf (originally Krottendorf). A village of Lower Austria, 30 miles south of Vienna (Map: Austria, E 2). It has acquired some political significance, owing to the fact that its castle was the residence of the Duchess of Angoulême after 1844, and later of the Count of Chambord (q.v.), and became the rendezvous of the elder Bourbon party.

FROISSART, frwä′sär′, Jean (c.1338-1410?). A French poet and historian, born at Valenciennes. He was destined for the Church, and consequently received a liberal education, but he soon displayed a passion for poetry and for the tales of chivalry. In 1361 he went to London to present to Queen Philippa a poem concerning the recent war between England and France. It secured for him a position as secretary to the Queen, who encouraged him to continue his work. In 1365 he made a journey to the Scottish Court at the expense and under the protection of Queen Philippa. In 1366 he left England in the train of the Black Prince, and in 1368 visited Italy under the protection of the Duke of Clarence. Upon the death of his patroness the Queen, in 1369, he returned to Valenciennes. Soon, however, he found new patrons who admired his writings. In 1370 he entered the service of Duke Wenceslas of Luxemburg. He was also befriended by Robert of Namur, to whom he dedicated the first book of his Chronicles, and by Guy of Châtillon, who, in 1373, appointed him curé of Lestinnes-les-Mouts. For ten years he led an uneventful life, working upon his Chronicles or composing poems with Duke Wenceslas. In 1383 he became the chaplain of Guy of Châtillon, who had just inherited the County of Blois. Then for fifteen years Froissart traveled much, seeking men who could tell of the great wars in which they had taken part. Thus in 1388 he visited the Court of Gaston Phœbus at Béarn. To this journey we owe the striking description of this remarkable tyrant, whom Froissart admired. In 1394 he visited England a second time. Little is known of his life after he returned from England, and the date of his death is uncertain.

The work for which Froissart is famous is his four books of Chronicles, in which he recorded the events and wars of the last three-quarters of the fifteenth century. He was engaged on this work for over forty years. He had little critical ability, and recorded supernatural tales with as much credence as he gave to knightly feats of arms. Nevertheless, he gives a masterly account of the character and manners of his age. He was able to describe most of the localities from his own knowledge, and he was fortunate in being able to consult important actors in every war which he described. Thus he learned of the Scottish wars from King David; of Crécy, from King Edward; of Poitiers, from the Black Prince; of the famous 'Great Companies,' from their commanders; of the death of Wat Tyler from Robert of Namur, who had been present.

In the first redaction of his first book he borrowed freely from Jehan le Bel's Chronicle. Later he made two revisions, and in each he deleted many of the portions borrowed from Jehan le Bel. One defect in his work, considered as an historical source, must be noted. Froissart was far from being impartial. In the first redaction of his first book he was an English partisan. In the second redaction, undertaken at the wish of Robert of Namur, he suppressed much that was favorable to England. In the third redaction, which he made after 1400, when he was filled with grief for the murder of Richard II., the grandson of his former patroness, he made some very severe reflections on the English nation. The best editions of his Chronicles are those of Kervyn de Lettenhove (25 vols., Brussels, 1863-77) and Luce (Paris, 1869-88, incomplete), in the publications of the *Société de l'histoire de France.* There are many other editions and translations, for which see Potthart, *Bibliotheca Historica Medii œvi*, vol. i. (Berlin, 1896). Special mention should be made of the fine old English rendering by Lord Berners. Froissart is also noteworthy as a poet. He wrote many verses, which were greatly appreciated by his patrons. His first production was entitled *L'épinette amoureuse* ("The Little Thorn of Love"), and is an account of his boyhood and first love affair. The *Dit du Florin,* which is partly autobiographical, is the most pleasing of his poetical works. The most lengthy was his *Meliador,* which he read to Gaston Phœbus. It is a poem twice as long as the *Divine Comedy* of Dante, and is an echo of the tales of the 'Round Table'; but although it contains beautiful and interesting passages, as a whole it is exceedingly prolix and tiresome. It has been published by Longnon for the *Société des Anciens Textes* (3 vols., Paris, 1895-99). The other poems have been published by Scheler (3 vols., Brussels). For Froissart's life, consult the introductions to the two editions of his Chronicles, which have been cited, the secondary works given in Potthast, and especially Mary Darmesteter, *Froissart* (Paris, 1894).

FROLIC, The. A British sloop of war captured in 1812 by the American sloop of war *Wasp*, under Captain Jacob Jones, who received a medal from Congress for the exploit.

FRÖLICH, frẽ'lĭk, Lorentz (1820—). A Danish painter and engraver, born at Copenhagen. He studied in Dresden under Bendemann, and in Paris under Coutoure. Afterwards he lived much in France, and constantly exhibited at the Salons. His drawings and illustrations are especially successful and are widely known. Among his pictures are "Peasant Pursued by Wolves" (1838); "King Harold Blaatand" (1840); "Cupid and the Water-Sprite" (1845); and "Family of a Wood-God"; also some decorative paintings in the Court of Appeals at Flensburg, Prussia, and also in some public buildings of his native land.

FROL'LO. A Roman knight, serving as Governor of France and killed by King Arthur, in an Arthurian legend of the fifteenth century, entitled *Arthur*, and other chronicles. He is also known as *Froll* or *Frolle*, and is mentioned in the first part of the ballad "King Arthur's Death," in Percy's *Reliques*.

FROLLO, Claude. In Hugo's *Notre Dame de Paris,* the lover of Esmeralda and victim of Quasimodo, who hurls him from the cathedral tower. He is an archdeacon of Notre Dame, and practices mysterious forms of magic. Jehan Frollo is a student in the same work.

FROME, formerly Frome Selwood. An agricultural and manufacturing town in Somerset, England, on the Frome, a branch of the Avon, 12 miles south-southeast of Bath, on the Great Western Railway (Map: England, D 5). Its staple products are broadcloths, silks, hats, ale, and cards for dressing woolen cloths. The town owns its water-works. The celebrated Selwood Forest, part of which still exists, was in the vicinity. Population, in 1891, 9600; in 1901, 11,000.

FROMENTIN, frō'mäɴ'tăɴ', Eugène (1820-76). A French painter and author. He was born near La Rochelle, France, October 24, 1820. His father was a physician of note in La Rochelle, who had an inclination toward art, which he had cultivated, while a student in Paris, in the ateliers of Bertin, Gros, and Gérard. In November, 1839, at the age of nineteen, Eugène was sent to Paris to study law. He became also much interested in literature, and was associated intimately with eminent authors, as Benjamin Fillon, Michelet, Quinet, and Sainte-Beuve. He wrote much himself, and at this time formed the vivid and charming style so well known in his later works. Not until 1840, at the age of twenty, did Fromentin show any disposition toward painting. His first known sketch is a recollection of the presentation of the play of *Chatterton*, by Alfred de Vigny, at the Théâtre Français. It gives no promise of the talent which he developed later. In 1843 he received his license in law and began to study for the doctor's degree. At this time, partly under the influence of the depression attendant upon an attack of fever, he decided to abandon law. He first entered the atelier of a mediocre painter, named Rémond, but a year later changed to that of Cabat. Fromentin occupied several studios in Paris, but finally settled in a little hotel in the Place Pigalle, which he occupied during the rest of his life. In 1846 occurred his first visit to Algeria. It was brief, and only a few sketches were brought back, but the main direction of his interest in life and art was then decided. Fromentin is essentially the painter of Northern Africa, the Sahara, and its oases. He first exhibited his Sahara pictures in the Salon of 1847. From this time on he was always either in the Sahara or in Paris.

Interest in Fromentin culminated in the Salon of 1859, when he received a first medal. The attention of Paris and the world had been especially awakened by his two newly published books: *Un été dans le Sahara*, which first appeared in the *Revue de Paris*, 1856, and *Une année dans le Sahel*, published in the *Revue des Deux Mondes*, in 1858. These two books were published together in 1879 by Plon, in a memorial edition, superbly illustrated with Fromentin's pictures of the Sahara. Fromentin published a novel, *Dominique*, in 1862. His most important literary effort is his critical work *Maitres d'autrefois* (1871, a history of Dutch and Flemish painting). His paintings are characterized by brightness and harmony of color. Among the most important are: "A Farm Near La Rochelle" (1847), his earliest work; "Gazelle Hunt in the Hodna" (1857); "A Street in El-Aghouat," owned by the French Government; "An Arab Bivouac at Sunrise," in the collection of Mr. Edouard Delessert, Paris; "A Hunt with the Falcon" (1863), in the Louvre; and "An Arab Camp," his last picture, also in the Louvre. Several good examples of his works are in America, notably in the Waters Collection, Baltimore, and in the Vanderbilt Collection, New York. Consult: Gonse, *Eugène Fromentin, peintre et écrivain* (Paris, 1881); Jouin, "Fromentin," in *Maîtres contemporains* (ib., 1887); Claretie, "Eugène Fromentin," in *Peintres et sculpteurs contemporains* (ib., 1882).

Fromentin died suddenly in Paris, August 26, 1876.

FROMMANN, frô′mȧṇ, GEORG KARL (1814-87). A German philologist, born in Coburg. One of his most important achievements was the revision of Luther's translation of the New Testament, which work he undertook in 1865 in association with ten other Protestant theologians. This revision was subsequently extended, at the request of the Protestant Conference, to the Old Testament; and the revised edition of the complete Bible appeared in 1892.

FROMMEL, frô′mĕl, EMIL (1828-96). A German theologian and author. He was born at Karlsruhe, and studied at Halle, Erlangen, and Heidelberg. After holding several pastorates, he served as army chaplain in the Franco-German War of 1870-71, and in 1872 was appointed Court preacher at Berlin and pastor of the garrison in that city. His principal theological works include: *Die zehn Gebote Gottes in Predigten* (6th ed. 1898); *In drei Stufen*, an anthology (8th ed. 1890); *Festflammen* (6th ed. 1896); *Das Gebet des Herrn in Predigten* (4th ed. 1893). He also wrote tales and miscellaneous essays, collected and published under the title of *Gesammelte Schriften. Erzählungen für das Volk. Aufsätze und Vorträge* (1873-97).

FROMMEL, KARL LUDWIG (1789-1863). A German landscape painter and engraver, born at Birkenfeld, Oldenburg. He studied at Karlsruhe, under the Court engraver, Haldenwang, and went to Paris in 1809 to paint from nature for the Empress Josephine, a cycle of twelve large landscapes in water-colors. He earned a considerable reputation during a prolonged stay in Italy (1812-17), was appointed professor at Karlsruhe after his return there, and became a very active promoter of several artistic enterprises. After a visit to London, in 1824, to acquaint himself with the technique of steel engraving, he opened at Karlsruhe a studio for that branch of art, and issued reproductions of well-known views in Italy which obtained a wide circulation. From 1830 to 1858 he was director of the picture gallery, which owes to his clever administration its present flourishing condition. In it are also preserved several of his attractive landscapes. Besides six original etchings, there are to be noted the engravings "Arricia Near Rome," "View of Tivoli," "Mount Vesuvius," and "Mount Ætna," as some of the best among many commendable for characteristic conception and delicate execution.

FROMMEL-LINDEMANN, lĭn′de-mȧn, KARL AUGUST. See LINDEMANN-FROMMEL.

FROMONT JEUNE ET RISLER AÎNÉ, frô′môɴ′ zhẽn ȧ rē′slȧ′ ȧ′nȧ′ (Fr., Fromont Jr. and Risler Sr.). A novel by Alphonse Daudet (1874), the story of an ambitious bourgeoise, Sidonie Chèbe, who, after a marriage with the rich Risler, keeps up an intrigue with Fromont, and at last ruins her lover and the firm.

FROND (Lat. *frons*, OLat. pl. *frundes*, foliage). In botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined, and was applied to the leaves of palms, etc. The term 'leaf' is now very generally used, even for mosses, ferns, etc., and the term 'thallus' for lichens. In algæ the term 'frond' is often used to designate the whole plant, except its organs of reproduction.

FRONDE, frôɴd (Fr., sling). The name given to the period of domestic intrigues and political troubles in France during the minority of Louis XIV., from 1648 to 1653. The grasping and despotic policy of Mazarin had given offense to all classes. The princes and nobles saw themselves excluded from all high offices in the State, and their places filled by foreigners; the Parlement of Paris saw itself threatened in its political rights; and the people complained of the burden of taxes and administrative abuses. The Parlement, therefore, commenced a course of determined opposition, refusing to register the royal edicts, more especially the financial measures initiated by Mazarin. Among the leaders in opposition, in addition to the first president, Mathie Molé, were the councilors Blancmesnil and Broussel. After Condé's victory over the Spaniards at Lens (August 20, 1648) had strengthened the hands of the Court party, violent measures were determined on, and on August 26, 1648, Blancmesnil and Broussel were arrested by order of Mazarin. The people took up arms, dispersed the Swiss Guard, and on the 27th of August erected barricades in the street around the Palais Royal. The Court now removed to Rueil, and after some negotiations yielded in so far that an ordinance was issued regulating the financial and judicial administration of the realm. This victory gave courage to the supporters of the Parlement, who continued to keep a sharp lookout on the Court, and were styled by the adherents of Mazarin *frondeurs*—i.e. censurers (literally, 'slingers'). The Court now resolved to suppress the movement, and on January 6, 1649, removed secretly to Saint-Germain, leaving Paris to be blockaded by the Prince of Condé with 7000 men. The Parlement, instigated by the astute Cardinal de Retz, and publicly supported by various nobles, including the Prince of Conti, the dukes of Longueville, Beaufort, Bouillon, and Elbeuf, and the Maréchal de la Mothe, called upon the people to resist. A sanguinary encounter at Charenton resulted in the defeat of the Frondeurs, and they were forced to enter into negotiations for peace. Accordingly, a treaty was made at Rueil, March 11, 1649, granting a general amnesty and regulating the matter of financial control. After the return of the Court to Paris in August, a new turn was given to the contest, the princes of the blood disputing the power with Mazarin. This, on January 18, 1650, led to the sudden arrest of Condé, Longueville, and Conti, which was the beginning of the new Fronde. The young sons of Louis XIII. were roused against Mazarin, and Marshal Turenne assumed the title of lieutenant-general of the royal army for the liberation of the princes. After some initial successes, Turenne, who was fighting in conjunction with the Spaniards, was finally completely defeated by Mazarin's troops under De Plessis, near Rethel, on December 15, 1650. Mazarin returned to Paris, but found all parties against him, and his removal was insisted upon so urgently that he was obliged to release the princes and flee to the Netherlands. A system of intrigue was now substituted for force of arms, and the contest, which had begun for the interests of the people, was converted into a Court cabal. Turenne was gained over by the Queen Regent, Anne of Austria, De Retz by Cardinal Mazarin, and Condé, who had made himself generally odious by his haughty conduct, was obliged to flee for safety into Guienne. Louis XIV., who had now attained his fourteenth year, endeavored to induce Condé to return; but the latter, mistrusting the King's overtures, repaired to Bordeaux in 1651, where he had many adherents. There he commenced a regular war against the Court which might have had dangerous consequences had not Turenne opposed the Prince. On July 2, 1652, an engagement took place between the two parties in the outskirts of Paris. Condé was in danger of defeat, when, through the efforts of his friends, he was allowed to enter Paris. Paris itself, weary of these fruitless dissensions, now entered into negotiations with the Court, demanding, however, the final removal of Mazarin, who had meanwhile returned. This demand was complied with by Louis XIV., and the royal entry took place October 21, 1652. Various nobles were exiled as a result of the contest. Condé, who refused to enter into the compact, and had quitted Paris on October 15th, repaired to Champagne; and finally, finding no one disposed to take up arms in his cause, entered the Spanish service, and was declared a traitor. Mazarin returned to Paris, and was once more intrusted with the reins of government. Thus ended the period of the Fronde in Paris, for the last signs of revolt in the provinces were suppressed only in 1653. The defeat of the Frondeurs contributed to make Louis XIV. an absolute monarch. Consult: Saint-Aulaire, *Histoire de la Fronde* (Paris, 1860); Barante, *Le parlement de Paris et vie de M. Molé* (Paris, 1859); Perkins, *France Under Richelieu and Mazarin* (New York, 1888); Pardoe, *Louis XIV. and the Court of France*, etc. (London, 1888); *Memoirs of Cardinal de Retz* (London, 1896). See CONDÉ; LOUIS XIV.; RETZ, CARDINAL DE; TURENNE.

FRONSBERG, frôns′bĕrᴋ. See FRUNDSBERG, GEORG VON.

FRONSPERGER, frôns′pĕrᴋ-ẽr, LEONHARD (c.1520-75). A German writer on the art of war. He was born at Ulm, and began the study of military science in early boyhood. In his celebrated *Kriegsbuch kaiserlicher Kriegsgerechte und Ordnungen vom Geschütz* (4th ed. 1596; rendered into modern High German by F. W. A. Böhm, vol. i., 1819), he displays a remarkable knowledge of army organization, equipment, fortification, military law, articles of war, and artillery practice. He is generally considered the most competent German military writer of the sixteenth century.

FRONTAL BONE. See SKULL.

FRONT DE BŒUF, frôɴ de bẽf. In Scott's *Ivanhoe*, a ferocious baron, who threatens Isaac the Jew in order to extort money. He is finally burned to death with his castle when it is stormed by King Richard and Locksley.

FRONTENAC, frôɴt′nȧk′, LOUIS DE BUADE, Comte de (c. 1621-98). The greatest of the Governors of New France. He was born in France about 1621. At an early age he entered the military service, and rapidly attained promotion. He became colonel at twenty-three and brigadier-general at twenty-six, and saw active service in Italy, Flanders, and Germany. In 1672 he was appointed to succeed De Courcelles as Governor of New France. Frontenac was choleric and arbitrary by nature, but extremely energetic, and sincerely ambitious to inaugurate an era of prosperity for Canada. His first act was to convene the three estates—Clergy, Nobles, and Commons—and to establish municipal government in Quebec. The royal policy, however, was adverse to the granting of extensive political rights to the Canadians, and the Governor's reforms in this direction were disapproved. He next became involved in controversies with the Jesuits, with the Intendant Talon, and with Perrot, the Governor at Montreal. These quarrels divided the colony into factions, and led at length to the recall of Frontenac in 1682. In 1689 he regained the King's favor, and was restored to his former position, which he held until his death, in November, 1698. Frontenac's first administration was especially marked by energy and tact in his dealings with the Indians, and by his encouragement of French explorations in the West. He aided Joliet, Marquette, and La Salle, and established posts at Mackinac, Niagara, and in the Illinois country. After his reappointment he waged a vigorous war against the Iroquois, who had reduced Canada to desolation, and against their allies and instigators, the English. The frontier towns of New England and New York were repeatedly ravaged by his punitive expeditions. His most signal achievement in these campaigns was the show of force by which he foiled Sir William Phips's fleet before Quebec in 1690. At different times he might have made peace with the Iroquois if he had been willing to abandon to their vengeance his Algonquin allies; but this he steadfastly refused to do, and it was not until his last campaign in the Mohawk country in 1696 that the Iroquois were brought to sue for peace. Consult: Winsor, *Cartier to Frontenac* (Boston, 1894); and Parkman, *Frontenac and New France Under Louis XIV.* (Boston, 1877).

FRONTERA, frôn-tā′rȧ. A seaport in the State of Tabasco, Mexico, 230 miles east by south of Vera Cruz; near the mouth of the Grijalva River on the Gulf of Campeachy. It is the port of San Juan Bautista, the capital of the State, and has a good harbor; its exports, which have an annual value of about $400,000, comprise coffee, cocoa, and dyewoods. Frontera is the residence of a United States consular agent. Population, about 3000.

FRONTIER, MILITARY. The furthermost limits of military lines of national defense, observation, and concentration. By the mutual consent of countries contiguous to each other, the military frontier is usually placed some little distance back of the actual geographical dividing line. The sentries of England and Spain at Gibraltar are separated by a strip of land agreed upon as neutral territory. With the principal military countries of Europe the various mobilization schemes are designed to secure the greatest possible concentration on the frontier, where they are knitted together by a more or less complete system of forts or intrenched camps. Both France and Germany keep their frontier corps at a much higher peace strength than the remainder of their armies. The most important British Indian camps of exercise, as well as their strongest points of concentration, are along the military frontier of Northwestern British India. The *Militärgrenze*, or military frontier, was the former name of a narrow strip of land along the Turkish frontier in Hungary and Croatia-Slavonia, which had a special military constitution. See FORTIFICATION; MOBILIZATION.

FRONTINO, frôn-tē′nô. The horse of Rogero, in Ariosto's and Boiardo's *Orlando*. He received it from Brunello, who in turn had stolen it from Sacrepant. When mounted on it Rogero was invincible.

FRONTI′NUS, SEXTUS JULIUS. A Roman author, who flourished in the second half of the first century A.D. In A.D. 74 he was sent to Britain as Governor of that island, and obtained a great reputation by his conquest of the Silures, and his vigorous maintenance of the Imperial authority. He appears to have been twice consul in the course of his life, and to have held several other important offices, notably that of *curator aquarum*, or water commissioner. He died about A.D. 105. Several works are attributed to Frontinus, only two of which are certainly genuine, the *Strategematica*, a treatise on the art of war, in three books; and the *De Aquis Urbis Romæ*, in two. The latter is a highly important technical account of the Roman aqueducts, and the marvelous water supply of the ancient city. There is an edition of the *Strategematica*, by Gundermann (Leipzig, 1888); and of the *De Aquis*, by Herschel, in *Two Books on the Water Supply of the City of Rome* (Boston, 1899), including the text, translation, and commentary.

FRONTISPIECE (from OF. *frontispice*, ML. *frontispicium*, front view, from Lat. *frons*, front + *specere*, to look). The name generally given to an engraved and decorated title-page of a volume, or an engraving or other illustration placed opposite the title-page. The term was formerly used in architecture to denote the front or principal face of a building.

FRON′TO, MARCUS CORNELIUS. A teacher and author. He was born at Cirta, in Numidia, and came to Rome in the reign of the Emperor Hadrian, where he soon obtained a high reputation as a teacher of eloquence. Antoninus Pius intrusted to him the education of Marcus Aurelius and Lucius Verus, both of whom always retained the warmest admiration of their preceptor. Fronto gradually rose to the highest offices of the Empire, became very wealthy, and died, it is thought, about A.D. 175. Until recently nothing was known of Fronto as an author, except from a few fragments of a grammatical treatise (*De Differentiis Vocabulorum*); but in the year 1814 Angelo Mai discovered in the Ambrosian Library at Milan a palimpsest, which, being deciphered, was found to contain a considerable number of Fronto's letters with some short essays. These were published by Mai in 1815; and in the following year an edition was published at Berlin by Niebuhr, who wrote a critical preface, and also printed the commentaries of Buttman and Heindorf. A few years afterwards Mai found in the library of the Vatican at Rome another palimpsest containing more than 100 of Fronto's letters, including his correspondence with the Emperor and with his royal pupils. The result was a new edition by Mai (Rome, 1823), embodying the new discoveries. The contents of these letters are on the whole unimportant, although they help to confirm the good opinion which history has formed of the Emperor Marcus Aurelius. The best edition is by Naber (Leipzig, 1867).

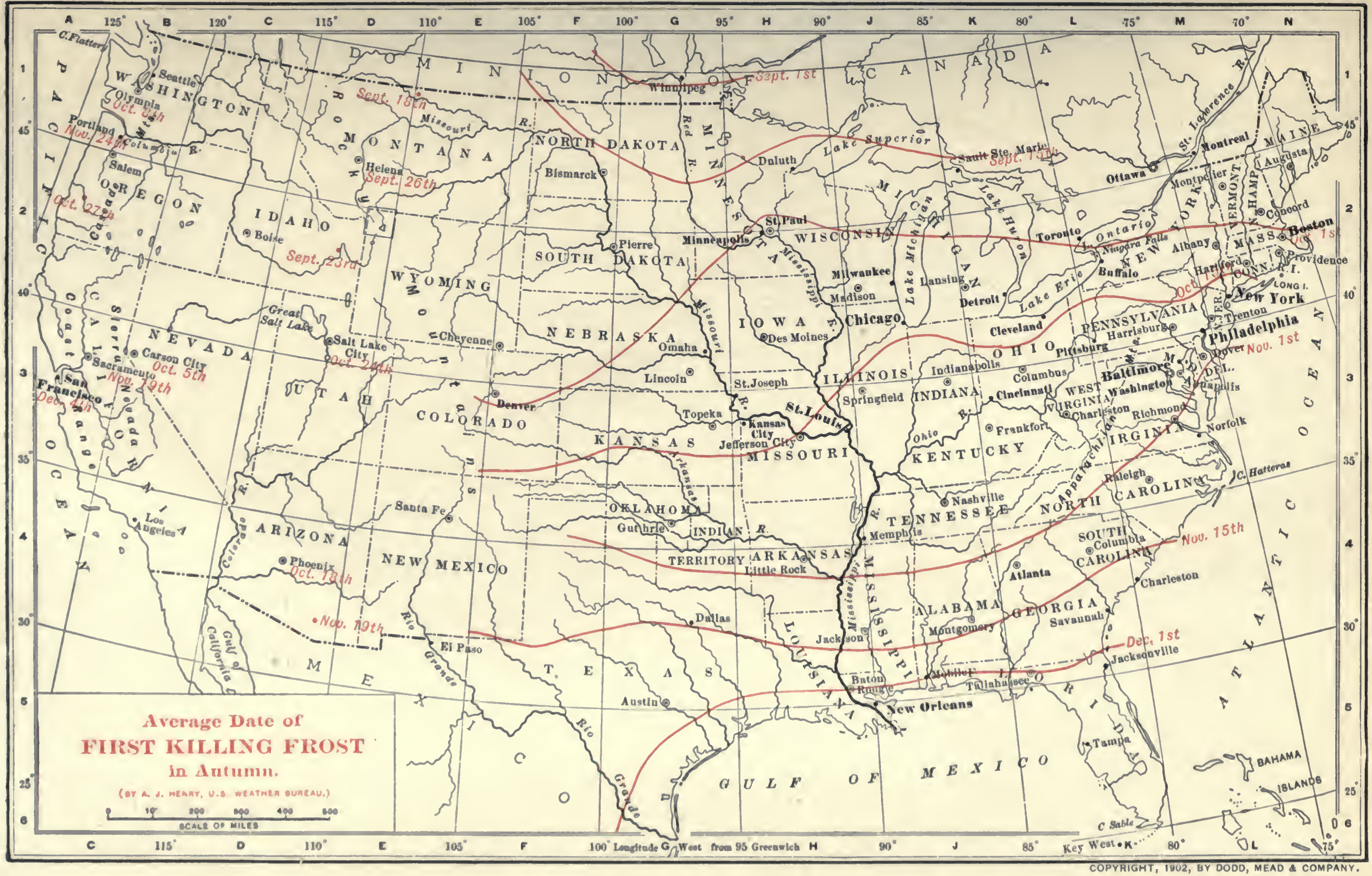
FRORIÈP, frô′rêp, ROBERT (1804-61). A German physician, born at Jena, and educated at Bonn. In 1833 he received a call to the Pathological Museum of the Charité at Berlin, of which he was director for nearly thirteen years. His medical and surgical atlases are widely known. They include: *Chirurgische Kupfertafeln* (96 parts, 1820-47); *Klinische Kupfertafeln* (12 parts, 1828-37); *Atlas der Hautkrankheiten* (1837); *Pferderassen* (6th ed. 1874); and *Atlas Anatomicus* (6th ed. 1877). His treatise *On the Therapeutic Application of Electro-Magnetism in the Treatment of Rheumatic and Paralytic Affections* (English translation by R. M. Lawrence, 1850) was a very important contribution to electro-therapy in its day.

FROSCHDORF, frôsh′dôrf. See FROHSDORF.

FRÖSCHL, frẽsh'l, KARL (1848—). An Austrian genre and portrait painter, born in Vienna. He studied first at the Academy of his native city, then under Wilhelm Diez in Munich, whither he returned after a sojourn of two years (1874-76) in Italy. In 1884 he settled again in Vienna, became very popular through his attractive and humorous scenes from child-life, and was much sought as a portrait painter by members of the Imperial family and aristocracy. His female portraits in pastel are particularly successful. Reproductions of his child-life scenes are embodied in the collections *Goldene Zeitung* (Munich, 1882) and *Fröschl Album* (Leipzig, 1890).

FROSINONE, frō′zê-nō′nâ. A city in South Italy, 53 miles southeast of Rome, near the junction of the River Cosa with the Sacco. There are ruins of the ancient Hernican Frusino, and large quantities of wine are marketed. Population of commune, in 1881, 10,000; in 1901, 11,191.

FROSSARD, frô′sär′, CHARLES AUGUSTE (1807-75). A French general. He was born at Versailles, studied at the military school at Metz, and served with distinction in the army. He participated in the siege of Rome in 1849, commanded the Second Engineer Corps in the Crimean War, and in 1855 was promoted to be brigadier-general. He was chief of the engineering department during the Italian campaign of 1859, and was afterwards made an officer of the Legion of Honor, and appointed Governor of the Prince Imperial. In the war with Germany he commanded the Second Corps of the Army of the Rhine, and headed the attack upon Saarbrücken (August 2, 1870). He was taken prisoner at Metz, and was detained until the close of the war. He published a *Rapport sur les*



Average Date of
FIRST KILLING FROST
in Autumn.

(BY A. J. HENRY, U.S. WEATHER BUREAU.)

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opérations du deuxième corps de l'armée du Rhin dans la campagne de 1870 (1872).

FROST (ME. *frost, forst,* AS. *forst,* from *freosan,* Eng. *freeze*). A formation of ice on the ground or on plants; also the temperature 32° Fahrenheit or 0° Centigrade that corresponds to the formation of ice and snow. When air whose dew-point is below 32° Fahrenheit comes in contact with a substance whose surface is colder than this, a portion of the aqueous vapor in the air is condensed upon that surface in the form of ice or frost; although this deposition is truly ice, yet the particles of ice are usually small, separate from each other, and reflect the rays of light in such a way as to make the deposit appear white, like crushed ice, instead of being transparent, as is the case with solid ice. In fact, the particles of ice usually have a crystalline structure, more or less perfect, as may easily be seen when moisture is deposited on the inside of a window-pane when the temperature outdoors is below freezing. In the latter case, when the air within the room has a dew-point far above the freezing temperature, the moisture first condenses in drops of dew upon the pane of glass, but is afterwards frozen into ice if the exterior cold is sufficiently intense.

When the air of the room has a dew-point below the freezing temperature, then the moisture is deposited upon the window-pane directly in the form of spiculæ or slender prisms of ice, and it is under these circumstances that the most delicate frost figures are formed. The latter is also the ordinary case in the formation of frost on vegetation and on the ground in the open air; in such a case every object is studded more or less thickly with small crystals of ice; the whole deposit is as white as snow, and is usually called 'hoar frost.' It frequently happens that rain (or sleet, which is frozen rain) falls on objects that are already colder than 32° Fahrenheit. In such cases the rain or sleet remains congealed as a layer of almost transparent ice on the upper surfaces of the limbs, the leaves, the fences, and other objects. This usually happens when rain falls at the close of a period of very cold weather. On the summits of high mountains, notably Mount Washington and the mountain stations of Southern Europe, it frequently happens that although the air is apparently clear, yet it is filled with the most minute drops of water, which are cooled far below the freezing-point, but retain their liquid condition. When these strike any object they lose their spherical shape, and are converted immediately into ice at the temperature of thirty-two degrees. They therefore build up an accumulation of ice on the windward side of every object, giving rise to remarkable displays of so-called 'frostwork.'

Aëronauts have occasionally ascended into and through thin layers of air bearing similar aqueous globules that are cooled below freezing, but still liquid water. These layers appear from a distance like thin stratus clouds, but are scarcely perceptible when viewed directly from below on account of their transparency. The globules instantly change to snowflakes or frostwork when they strike any object.

Tender vegetables in northern gardens and tropical plants in the southern portion of the United States and in California are severely injured or killed by freezing temperatures. The mere deposition of frost on the outside of such plants does not necessarily argue that the plant is frozen through and through; it may, therefore, produce only slight damage; on the other hand, when the air is too dry to deposit much moisture, and when it deposits frost only when cooled greatly below 32° Fahrenheit, it often happens that the plants are frozen under a clear sky or during a cold, dry wind without the deposition of much, if any, frost upon their exterior surfaces; in such cases the sap within the cells and especially within the medullary rays is frozen; the structure of the plant is destroyed, and when the sun's warmth has melted the frozen sap, the leaves and stalks sink to the ground, wilt away, and turn black, being in fact dead. This phenomenon is known as the black frost. It is, however, more properly a freeze than a frost.

The interval between the last frost of spring and the first frost of autumn is the so-called growing season of the agriculturists. Between these dates tender plants of all kinds must perfect their crops, while those that can withstand frosts continue their growth uninterruptedly. Especially must the great staple crops of the country—the Indian corn or maize, the cotton, tobacco, and a large range of tender fruits, as well as spring wheat, rye, and buckwheat—all complete their growth between these dates. The accompanying maps show by curved lines the regions in the United States over which the first and last frosts occurred on given dates on the average of the past thirty years. A comparison of these maps will therefore show the length of time that is available as a normal growing season in any part of the country. Although agriculturists always select seed that is likely to produce a quick-growing crop that may be harvested before the early frost of autumn, yet, owing to the irregularities of climate, the late spring frosts and the early autumn frosts frequently bring their crops into jeopardy. This has stimulated the invention of many methods of frost protection, which are fully described in the *Monthly Weather Review* for the years 1894-97, and especially in *Bulletins on Frost Protection*, Nos. 23 and 29, issued by the Weather Bureau.

The methods of frost protection are divided into several categories, as follows: (1) A light screen of any material, even a few slats or a gauzy veil, stretched above a plant prevents the radiation of the plant's heat into space, and by reflecting back the heat from the soil may keep the temperature of the plant so high as to prevent frosty temperatures. (2) Fires with clouds of smoke warm the air of a field while the smoke cloud prevents radiation; in perfectly still air such a cloud of smoke will spread evenly in all directions, and continue effective through the night. (3) Without reliance upon a cloud of smoke, one may warm the ground and the air either by fires, or by streams of water, or by flooding the field. All these methods and various combinations of them are in regular use for the protection of tropical fruits in California and Florida, and for the protection of tobacco, cranberries, and early vegetables in Northern States. Many patented devices for making smudges are on the market, but in general the smudge disfigures the fruit, and other protective devices are preferred.

Although the tender portions of plants are destroyed by frost, yet the ripened mature seed is much less susceptible. The kernels of both corn and wheat may be subjected to very low temperatures without being injured. Unfortunately, many of the bacterial germs and fungoid spores also are not injured by cold. It was formerly supposed that freezing weather destroyed the germs of malarial and yellow fever; but it is now probable that such germs are not affected by cold, but that, on the other hand, the cold checks the mosquitoes and other insects by which these germs are introduced into the human body.

The prediction of frost is a matter of great importance to a farmer, and can usually be made with great exactness by the help of the daily weather map, wherefore special attention is paid to this subject by the officials of the Weather Bureau. All persons whose interests depend largely upon the knowledge of frost keep in close touch with the Weather Bureau, and receive special telegrams when freezing temperatures are approaching. In general, when the dew-point is below 32° F. and the night is still and clear, the temperature will fall rapidly, and it may reach the freezing-point before sunrise.

Inasmuch as severe frosts have sometimes been very destructive to the staple crops, they have occasionally been the direct cause of severe famines; lists of memorable frosts for the last four hundred years will be found in Andrews, *Famous Frosts and Frost-Fairs in Great Britain* (London, 1887); also Walford, paper on "Famines" in *Journal of the Statistical Society* (London, 1878). The record for the United States will be found most conveniently in Pierce on *The Weather* (Philadelphia, 1860), and in the successive numbers of the *Monthly Weather Review* (Washington).

A special and elegant form of frostwork occurs as 'ice needles' or 'ice columns,' that rise up in masses from gravelly ground, raising up the top layer of gravel and small stones on their summits to a height of two, four, or six inches. These ice columns are hollow, and are apparently formed by the freezing of the films of moisture that rise up from the lower warm wet soil and freeze on the under side of the top layer of stones when the latter are chilled by radiation during clear nights. These columns do not form when the air is cold enough to freeze the soil below the top layers. A similar formation exudes from a thin crack in the bark of a tree when the warm body of the tree affords sap enough. The mechanics of this process is partially explained by Prof. Cleveland Abbe in the *American Meteorological Journal* for April (1893).

FROST, Arthur Burdett (1851—). An American caricaturist and illustrator. He was born at Philadelphia, January 19, 1851. At fifteen years of age he was for six months in an engraver's employ. He became a lithographer, and afterwards studied in the Philadelphia Academy of Fine Arts under Thomas Eakins. Subsequently he worked for the New York *Graphic.* In 1876 he entered the studio of Harper & Brothers, and was associated with Abbey, Reinhart, and Alexander. In 1877-78 he worked in England. Frost's works show thorough draughtsmanship. Honesty is the principal characteristic of the artist. He draws all the elements that compose the picture with equal interest and sympathy. His first illustrations for a volume, entitled *Out of the Hurly-Burly,* attracted much notice. Other important illustrations are found in Stockton, *Rudder Grange* (1879); Octave Thanet, *Stories of a Western Town* (1893); Bunner, *Stories of a New York House* (1887). Publications of his own are: *Stuff and Nonsense* (1888); *Bull Calf, and Other Tales* (1892); *Golfer's Alphabet; Sports and Games in the Open.*

FROST, Jack. See Jack Frost.

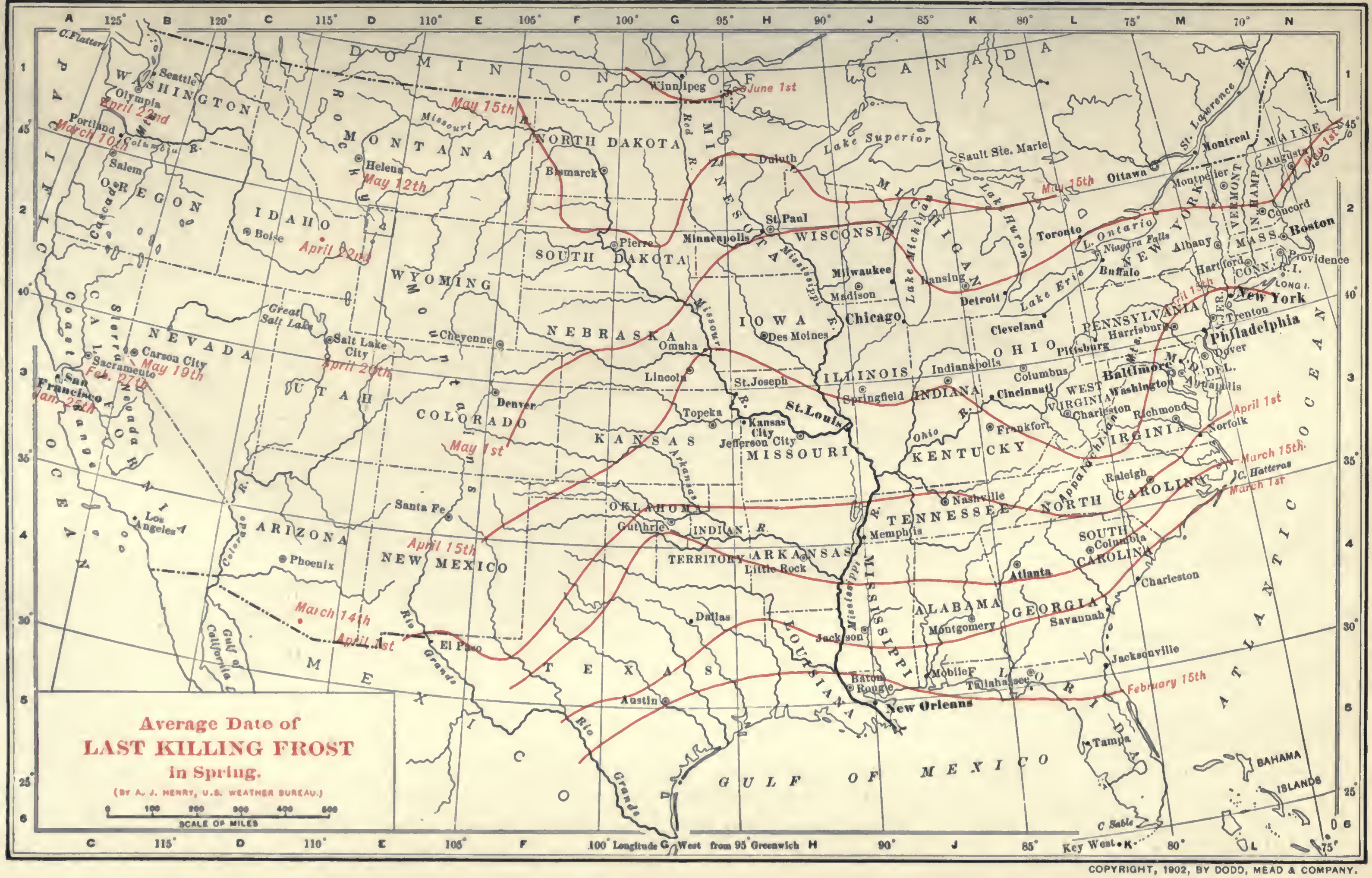
FROST, John (1800-59). An American compiler. He was born in Kennebunk, Maine; graduated at Harvard, and taught in Boston and Philadelphia. He published a great number of works, comprising school and juvenile books, and historical and biographical compilations, among which may be mentioned: *Pictorial History of the United States* (2 vols., 1844), which was exceedingly popular; *Picture History of the World; Lives of American Generals;* and *Lives of American Naval Commanders.*

FROST, Percival (1817-98). An English mathematician, born at Hull. He attended school at Beverley and Oakham, and in 1835 entered Saint John's College, Cambridge. Although as a boy he showed great aptitude for classics, at Cambridge he devoted his attention chiefly to mathematics. He was made a fellow of Saint John's in 1839, and on his marriage in 1841 he became tutor in mathematics, among his pupils being, somewhat later, W. K. Clifford. He held a mathematical lectureship at Jesus College for twelve years, and afterwards at King's College for thirty years, becoming Fellow of King's and taking his degree of Sc.D. (Camb.) in 1882. His chief works were *A Treatise on the Principia* (1854); *A Treatise on Solid Geometry* (with Wolstenholme, 1863); and *A Treatise on Curve-Tracing* (1872). Consult Taylor's biographical note in the *Proceedings of the London Mathematical Society,* vol. xxix. (London, 1898).

FROST, William Edward (1810-77). An English painter. He was born at Wandsworth in September, 1810, and studied at the Royal Academy. At first he painted portraits; but, under the influence of Etty, devoted himself to mythological subjects. In 1839, he exhibited "Prometheus Bound," for which he received the Academy's gold medal. In 1847 he won a competition prize by his cartoon, "Una Alarmed by the Fauns." Among his works are the "Bacchanalian Revel" and "Disarming of Cupid" (1850), in the King's possession; "Narcissus" (1857); "Hylas and the Nymphs" (1867); and "Masidora" (1871). He died in London, June 4, 1877.

FROST-BIRD, or **FROST-SNIPE.** An American gunner's name for the stilt sandpiper (*Micropalama hirmantopus*). See Stilt; and Plate of Beach-Birds.

FROSTBITE. A term usually applied to local effects of cold, although it may be properly used to designate all results of low degrees of temperature, from chapped hands to freezing to death (*asphyxia congelatorum*). The frostbitten part is at first pale, cold, tingling, and numb; then strong, stiff, with loss of sensation and motion; later, shrunken, hard, even brittle, livid and mottled from coagulation of blood in the veins. Molecular death occurs, the blood-corpuscles disintegrate, sloughing and mortification



Average Date of
LAST KILLING FROST
in Spring.
(BY A. J. HENRY, U.S. WEATHER BUREAU.)

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result, and a line of demarcation is established. (See Gangrene.) Although a sudden violent application of cold may cause death of the tissues by reducing the temperature to a degree incompatible with animal life, the most common cause of the destructive effects of moderate frostbite is perhaps the excessive reaction which occurs on sudden removal of the cold, or the application of heat; this is especially the case with moist cold.

Most cases of frostbite are very trifling, the most common being chilblains. (See Chapped Hands and Chilblains.) The treatment of frostbite is most prudently effected by friction, at first with snow, then with ice-water, and then with water at ordinary temperature, no warmth being applied for some time. If the frozen part is brittle, spraying with ice-water must be substituted for rubbing with snow. As the coldness subsides, the painful tingling and then redness and heat return; in a short time the heat is above the normal, and a febrile reaction sets in. Partial recovery may always be expected unless the freezing has been continued too long. When sloughing begins it is necessary to employ supportive and stimulative treatment, with hot fomentations, turpentine dressings, carbolized-oil applications, etc., as adjuvants. After the line of demarcation is established, amputation should be performed by a surgeon. Eczema and pruritus may follow moderate frostbite. Partial paralysis of the parts supplied by the facial and radial nerves, or even hemiplegia, may follow. The use of alcoholic drinks when exposed to cold is a fatal mistake. The drug brings heat to the surface of the body, where it is rapidly lost, and the vitality of the individual is lowered. Alcoholism contributes forcibly to a fatal result in comparatively mild frostbite, from which temperate persons would quickly recover.

FROST′BURG. A town in Allegany County, Md., 163 miles southeast of Pittsburg, Pa.; on the Cumberland and Pennsylvania Railroad (Map: Maryland, B 2). It is picturesquely situated at an elevation of about 2200 feet, and is a summer resort. It is the seat of a State normal school. Frostburg has large fire-brick works, planing-mills, foundries, etc., but is engaged chiefly in coal-mining. The government is administered under a charter of 1870, which provides for a mayor, chosen annually, and a city council elected at large. The water-works are owned and operated by the municipality. Population, in 1890, 3804; in 1900, 5274.

FROSTFISH. (1) A slender, scaleless, pelagic fish (*Lepidotus caudatus*), elsewhere known as scabbard-fish (q.v.), but called frostfish in New Zealand, where it visits the coast to spawn at irregular intervals, and is much sought after as a delicacy by a strange method of capture. It has the extraordinary habit, in winter, of coming ashore alive on certain sandy beaches, where it wriggles on to the firmer sands above the surf-line, there to die or be quietly devoured by some animal. No satisfactory reason has yet been assigned for this suicidal proceeding, but it is taken advantage of by the 'fisherman.' When the night is clear and calm, with comparatively low surf, as well as frosty, the fish may be expected; and then parties of men go to the beach shortly before daybreak (or perhaps camp there overnight and rise early), and walk back and forth, seizing the fish as they come floundering out of the surf and killing them.

(2) In New England, a tomcod (q.v.).

FROTH-FLY, FROTH-HOPPER, FROG-FLY, or **FROGHOPPER.** Insects of which the young—larvæ and pupæ—are found in a frothy exudation on plants. They form the family Cercopidæ of homopterous bugs, and are allied to aphids, and still more nearly to cicadas and lantern-flies. The larvæ and pupæ differ little in appearance from the perfect insect, except that the latter possesses four large wings. The froth, commonly called frog-spittle, is believed to be composed of sap which the insect sucks up through its proboscis. The sap passes through the intestine and is emitted as a clear mass, into which the insect draws bubbles of air by means of its tail claspers, and thus makes foam. When the insect is about to transform, the foam dries in such a way as to produce a shelter for the ensuing quiescent stage. The most common one in the Eastern United States is *Aphrophora quadrangularis.* Some of the tropical forms assume very bizarre shapes, caused by outgrowths from the thorax. The fluid is emitted by some species in drops which may be thrown a considerable distance, causing the phenomenon known as weeping trees. A few dozen larvæ of a Madagascar form may exude a quart of fluid in an hour and a half. Frog-spittle is supposed to be produced as a protective covering for the young insect, but in spite of it certain Hymenoptera pick the larvæ out and carry them off to be stored as food for their larvæ. The winged stage is a much flattened one and capable of long leaps, whence the name 'froghopper,' first given to them because they came from the 'frog-spittle,' is doubly appropriate.

FROTHINGHAM, frŏth′ing-am, Arthur Lincoln (1859—). An American archæologist and educator, born in Boston, Mass. He studied at the Catholic Seminary of San Apollinare, Rome, Italy; the Royal University of Rome, and the University of Leipzig (Ph.D., 1883); was fellow in Semitic languages and lecturer in archæology at the Johns Hopkins University in 1882-86; in 1887 was appointed to the Princeton chair of archæology and the history of art, and in 1898 became professor of archæology and ancient history. In 1884 he was secretary of the Archæological Institute of America; in 1885 founded *The American Journal of Archæology,* of which he was owner and editor until 1896; and in 1895-96 was an associate director of the American School of Classical Studies at Rome. His publications include contributions to periodicals, monographs on sculpture and painting; *Stephen Bar Sudaili, the Syrian Mystic and the Book of Hierotheos* (1886); and (with A. Marquand) *A Text-Book of the History of Sculpture* (1896). He prepared articles on architecture for The New International Encyclopædia.

FROTHINGHAM, Ellen (1835-1902). An American translator, the daughter of Nathaniel Frothingham. She was born in Boston. She made a special study of German literature, and is well known for her translations into English of Lessing's *Nathan der Weise* (1868); Goethe's *Hermann und Dorothea* (1870); Auerbach's *Edelweiss* (1871); and Lessing's *Laokoon* (1874).

FROTHINGHAM, Nathaniel Langdon (1793-1870). An American clergyman and writer. He was born in Boston, and graduated at Harvard in 1812, where he subsequently became the first professor of rhetoric and oratory. In 1815 he was ordained pastor of the First Church (Unitarian), in Boston, which position he occupied until 1850, when he left the pulpit, and devoted himself to literature. He published: *Sermons in the Order of a Twelvemonth* (1852), and *Metrical Pieces, Translated and Original* (1855). He also contributed largely to periodical literature, and was a thorough student of German, when such scholarship was rare in America. His biography was written by his son, Octavius Brooks Frothingham.

FROTH′INGHAM, Octavius Brooks (1822-95). An American Unitarian clergyman. He was born in Boston, November 26, 1822, a son of Rev. Nathaniel Langdon Frothingham. He was graduated at Harvard College in 1843, at the Cambridge Divinity School in 1846, and was settled as pastor of the North Church (Unitarian), Salem, Mass., in 1847. In 1855 he became minister of a church in Jersey City, N. J., where he remained four years. In 1859 he accepted a call to the pastorate of the newly formed Third Unitarian Congregational Church in New York, and remained at that post for twenty years, when ill health compelled his resignation. From the beginning he belonged to the most radical wing of the Unitarians, and the name of his church was finally changed from the 'Third Unitarian' to the 'First Independent Liberal Church of New York,' the connection with the Unitarian denomination being thereby sundered. After 1881 he resided in Boston, and devoted himself to literary work. He died November 27, 1895. Frothingham was one of the founders of the 'Free Religious Association,' and its president for the first twelve years of its existence. He ranked high as a scholar, and as a preacher was impressive and eloquent. He contributed largely to the periodical press, on a great variety of subjects, and published more than two hundred sermons. Other works worthy of mention are: A translation of Renan's *Studies of Religious History and Criticism* (1864); *History of Transcendentalism in New England* (1876); *History of Boston Unitarianism from 1820 to 1850*, including a memoir of his father (1890); and lives of Theodore Parker (1874), Gerrit Smith (1878), George Ripley (1882), William Henry Channing (1886), and David Atwood Wasson (1889).

FROTHINGHAM, Richard (1812-80). An American journalist and historical writer, born in Charlestown, Mass. He was a member of the State Legislature in 1839, 1840, 1842, 1849, and 1850; was Mayor of Charlestown in 1851-53; was a delegate to the National Democratic Conventions of 1851, 1852, and 1876; and from 1852 to 1865 was managing editor of the Boston *Post*, of which he was also for many years a proprietor. He devoted much of his time to historical study, and published, in addition to pamphlets and magazine articles, a *History of Charlestown* (1848); *History of the Siege of Boston* (1849); *Life and Times of Gen. Joseph Warren* (1865); and *The Rise of the Republic of the United States* (1871), his most important work.

FROTTOLA, frŏt′tō-lȧ (It., ballad). A kind of Italian folk-song, much cultivated in the sixteenth century. It was midway between the very simple villanella (q.v.) and the more elaborate madrigal (q.v.). Between 1504 and 1509 Petrucci published nine books of Frottole. The words were generally of an erotic character.

FROUDE, frōōd, James Anthony (1818-94). An English historian, littérateur, and educator. The youngest son of Robert Hurrell Froude (1771-1859), Archdeacon of Totnes, he was born at Dartington, Devonshire, April 23, 1818. He was educated at Westminster School, and at Oriel College, Oxford, where in 1840 he obtained a second-class in classics, and in 1842 graduated B.A., won the Chancellor's Prize for an English essay, and was elected a fellow of Exeter College. He graduated M.A. in 1843, and to retain his fellowship took deacon's orders in 1844, which the Clerical Disabilities Act enabled him to relinquish in 1872. For, influenced by the Tractarian movement, of which his brother Richard Hurrell Froude and Newman were leaders, his views changed, and his early works, *The Shadows of the Clouds* (1847), published under the pen-name of "Zeta," and the *Nemesis of Faith* (1848), being condemned by the University authorities, he resigned his fellowship, also an appointment as head-master of the Hobart High School, Tasmania, abandoned the clerical profession, and devoted himself to historical study and literature. He wrote for the *Westminster Review* and other periodicals, including *Fraser's Magazine*, of which he subsequently became editor, and in 1856 appeared the first volume of *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada* (12 vols. 1856-1870), on which his fame chiefly rests. In 1869 he was elected rector of Saint Andrews University, and received the degree of LL.D. The preparation and publication of his important historical and biographical works were relieved by intervals of travel and lecture. In 1872 his lectures in the United States on the relations between England and Ireland, in which, arguing from historical parallels, he scoffed at all attempts to conciliate the Irish, involved him in an animated controversy with the Dominican Father Thomas Burke. In 1849 Froude married Charles Kingsley's sister-in-law, Charlotte Maria, fifth daughter of Pascoe Grenfell. She died in 1860, and seventeen months later he married Henrietta Elizabeth, daughter of John Ashley Warre. Upon her death, in 1874, he resigned the editorship of *Fraser's Magazine*, and in 1874, and again in 1875, was sent by the Earl of Carnarvon, Secretary of State for the Colonies, to the Cape of Good Hope to investigate the plan of South African federation. The result of these missions was singularly unfortunate and disastrous to Lord Carnarvon's policy, owing to Froude's tactless speeches and representations. In 1884-85 he visited Australia, and in 1886-87 the West Indies; he wrote accounts of these two visits, which were violently assailed by colonial writers as biased and misleading. As Carlyle's personal friend and literary executor, he edited his *Reminiscences* (2 vols., 1881), Mrs. Carlyle's *Letters and Memorials* (1883), and *Thomas Carlyle: A History* (4 vols., 1882-84), but their copious personal criticism excited much discussion as to Froude's editorial discretion. In 1892 he succeeded Edward A. Freeman (q.v.), one of his most caustic critics, as regius professor of modern history at Oriel College, Oxford. Froude died at Salcombe, Devon, October 20, 1894. Besides the works already mentioned, his writings include: *The English in Ireland in the Eighteenth Century* (3 vols., 1872-74); *Short Studies on Great Subjects* (2 vols., 1877-82); *Cæsar* (1879); *Two Lectures on South Africa* (1880); *Oceana* (1886); *The English in the West Indies* (1888); *The Two Chiefs of Dunboy* (1889), an historical romance; *Life of Lord Beaconsfield* (1890); *Erasmus* (1894); and *Elizabethan Seamen* (1895). Froude was afflicted with constitutional sentimentality and an unfortunate, if unconscious, facility for inaccurately adapting facts to suit the views he sought to promulgate. His partisan glorification of Henry VIII. as the disinterested and magnanimous executor of the public wish in regard to ecclesiastical reform is one of the most striking examples. Hence the frequent storms of protest and criticism that his writings evoked, and the blemishes of his otherwise splendid works. For, although he at times subordinated accuracy to the exigencies of descriptive, vivid, and emphatic writing, and justified his action on the score of dramatic effect, the lucidity and beauty of his style make his works rank among the finest examples of English prose of the nineteenth century, and have earned for his *magnum opus* an imperishable position in the chronicles of British history. Of Froude there is yet no biography. Consult: the London *Times* for October 22, 1894; the introduction to Wheeler's edition of *Historical and Other Sketches* (New York, 1883); Birrell, in *Scribner's Magazine*, xvii., 149; Goldwin Smith, in *North American Review*, clxi., 677; Stephen, in *National Review*, January, 1901; Godkin, in the *Nation*, liv., 318; and Conway, in same, lix., 378, 401.

FROUFROU, frōō'frōō'. A five-act comedy, the most celebrated work of Meilhac and Halévy, produced at the Gymnase in 1869. The heroine, Gilberte, a high-spirited girl, called Froufrou, is spoiled first by her father, then by her husband, whom she deserts for a lover. She returns at last, is pardoned by her husband, and dies in his house. The play has enjoyed great success.

FROZEN STRAIT. A passage leading northwest from Fox Channel, the northern continuation of Hudson Bay, toward Repulse Bay (Map: Canada, O 3). It separates Southampton Island from Melville Peninsula. It is 15 miles wide, and although in the 66th degree of latitude, is nearly always ice-bound and inaccessible to navigation.

FROZEN WELLS. Wells in which ice is found either with or without water. They occasionally occur in the United States and Europe. A famous one in Brandon, Vt., was sunk through a mass of frozen ground fifteen feet thick, and formerly showed ice at fourteen feet below the surface in the summer time. In most frozen wells the ice lasts until late summer, and the temperature is seldom above the freezing-point. The low temperature and ice were originally attributed to the fact that the well pierces a stratum of glacier drift in which ancient glacier ice still survives, but the researches of Kimball have shown that this extreme hypothesis is quite unnecessary. He has demonstrated that the low temperatures in frozen wells, ice-caves, and similar situations are due to the percolation of cold air into the interior of the earth during cold winter weather and the coldest hours of the morning. He has shown that the deserted iron-mines at Westport, New York, give a complete key to the method of formation of ice in caves and wells. Consult *United States Monthly Weather Review* (Washington, 1901). See ICE-CAVES.

FRUCTIDOR, fru̥k'tĭ-dôr' (Fr., from Lat. *fructus*, fruit, Gk. δῶρον, *dōron*, gift). The twelfth month of the French Republican calendar. It ran from August 18th to September 16th in the years I.-VII. and from August 19th to September 17th in the years VIII.-XIII., being followed by five supplementary days, known as sans-culottides, which filled out the year. The 18th Fructidor, Year V. (September 4, 1797), is celebrated as the day on which Barras, Rewbell, and La Reveillère, members of the Directory, by a coup d'état, expelled their colleagues Carnot and Barthélemy, and saved the Republic from the machinations of the party of reaction, who had obtained the upper hand in the Council of Five Hundred. See FRANCE.

FRUCTOSE. See SUGAR.

FRU'GAL, LUKE. The villain of the two brothers whose temperaments are contrasted in Massinger's *City Madam*. His brother John's generosity is set over against his hypocrisy, much as Sheridan contrasts the brothers Surface.

FRUGONI, frōō-gō'nā, CARLO INNOCENZIO MARIA (1692-1768). An Italian poet of the Arcadian coterie, remarkable mainly for his power of improvisation, in virtue of which he was one of the most indefatigable writers of occasional verse in his time. Born at Genoa, November 21, 1692, he became a cleric, a teacher of rhetoric in various places in Italy, and poet laureate at the Court of Parma. He seems to have taken monastic vows rather under compulsion than of his own accord, and he found them so irksome that Pope Clement XII., at the instance of Cardinal Bentivoglio, had him released from the rigid obligations of life in the cloister, though, of course, not from his sacerdotal duties.

Frugoni represents the third rhyming manner of the Arcadian Academy, a school of Italian writers, which was founded in 1692, and whose activity ended with our author. He had some success in the pastoral song, but after all he remains noteworthy chiefly as an exceedingly facile improviser, who also possessed a very lively fancy. Consult: his *Opere poetiche* (10 vols., Parma, 1779), which contains his *Memorie storiche e letterarie;* the *Poesie dell' abbate C. I. Frugoni* (15 vols., Lucca, 1779-80), the most nearly complete edition; a good selection from his verse in Carducci, *Poeti erotici del sec. XVIII.* (Florence, 1878); some *Lettere inedite*, published by Bertoldi (Forli, 1891), and others published by Mazzatinti (ib., 1892); the biography in Fabroni, *Vitæ*, vol. i. (1778-1805); Torelli, "C. I. Frugoni," in his *Pæsaggi e profili* (Florence, 1861).

FRUIN, froin, ROBERT (1823-99). A Dutch historian, born in Rotterdam. He was educated at Leyden, where he was appointed professor of the history of the Netherlands in 1860. He was editor of the *Nijhoff's Bijdragen voor Vaderlandsche Geschiedenis*, and was a frequent contributor to *De Gids*, and other publications. He was regarded as the greatest living authority on Dutch history, and his work entitled *Tien Jaren nit den tachtigjarigen Oorlog* (4th ed. 1889) is considered one of the best historical works of modern times. His *Reply to Sir Bartle Frere*, and an *Appeal to the People of England* (1881) relative to the Transvaal question, created considerable comment. Another of his publications is *Geschiedenis der staatsinstellingen in Nederland tot den val der Republick* (1901). His *Verspreide Geschriften* were published by Block, P. L. Müller, and S. Müller in 1900.

FRUIT (OF., Fr. *fruit*, Lat. *fructus*, fruit, from *frui*, to enjoy). The structure that ripens in connection with the seeds in the spermatophytes (seed-plants). In popular application the term is also used in connection with the sporogonium of mosses (q.v.), and the sori of ferns (q.v.); but it is misapplied in these senses. The structures of seed-plants included in the fruit are exceedingly variable. In typical cases the fruit is the ripened ovary, as in ordinary pods, the transformed wall being called the pericarp; in apples it includes floral structures outside of the ovary; in strawberries it consists in the main of a very much enlarged receptacle; while in pineapples it is the whole inflorescence. So variable are fruits in structure that it is difficult to classify them satisfactorily, and it is not profitable to give a complete list of the numerous and often pedantic terms which have been applied to them. It will be sufficient to describe the principal forms. It seems to be most convenient to divide fruits into two great divisions, Dry Fruits and Fleshy Fruits.

Dry Fruits. Dry fruits either open (dehisce) in various ways to discharge their seeds, or they contain but a single seed, which accompanies the fruit in the dispersal. The dry fruits, therefore, naturally fall into two groups: (1) those which are dehiscent, and (2) those which are indehiscent. Such fruits also consist of the ripened ovary, and therefore have a strict morphological boundary. (1) *Dehiscent fruits* have received the general name of 'pods,' and are grouped on the basis of the number of carpels they contain and the method of dehiscence. The prominent forms are as follows: *Follicle*, a pod consisting of a single carpel, and dehiscing by splitting down the inner side, as in the peony. *Legume*, a pod consisting of a single carpel, and dehiscing by splitting down both sides into two pieces or valves, as in the common pea and bean. Very frequently legumes are simply spoken of as pods, and they are so characteristic of the great pea family that it has been called the Leguminosæ. *Capsule*, a pod consisting of more than one carpel, and dehiscing variously. The dehiscence is said to be septicidal when the carpels separate from one another, and in such case each carpel may split down the inner face as if it were a follicle, as in the genus Hypericum. In other cases the carpels do not separate, but each one splits down the back, such dehiscence being called loculicidal, as in iris, evening primrose (Œnothera), etc. In still other cases there are no slits of dehiscence, but the seeds are discharged through pore-like openings near the summit of the capsule, as in the common poppy. *Silique*, the peculiar pod of the mustard family (Cruciferæ), which consists of two carpels, and is divided into two chambers by a false partition, to which the seeds are attached. In dehiscence the two carpels split away as two valves from the membranous partition, which is thus exposed with its attached seeds. *Silicle*, a short silique, which is little if at all longer than broad, as in the common shepherd's-purse (Capsella), *Pyxis*, a pod which opens by means of a cap-like lid, as in twinleaf (Jeffersonia).

(2) *Indehiscent fruits* mature but a single seed, although they are often derived from an ovary composed of more than one carpel, and the pericarp so closely invests the seed that such fruits are popularly spoken of as seeds. Common illustrations are as follows: *Achene*, or *Akene*, the most common seed-like fruit, characteristic of the great family Compositæ, to which belong the sunflowers, thistles, dandelions, etc. In this family the achene commonly bears at its summit the modified calyx (pappus), which in the form of a tuft of hairs or plumes, bristles, hooks, etc., aids in dispersal by wind or animals. *Caryopsis*, or *Grain*, the peculiar seed-like fruit of the grasses, as maize, wheat, barley, rice, etc. *Nut*, a dry indehiscent fruit, in which the pericarp becomes very hard and bony, as in the acorn, chestnut, beechnut, etc. Very commonly there is associated with the nut a peculiar involucre, as that which forms the cup of the acorn and the characteristic investment of chestnuts and beechnuts.

Fleshy Fruits. Fleshy fruits are indehiscent, since the flesh is intimately associated with the seeds in their dispersal. It is these fruits which are so variable on account of the different structures which ripen. The most common forms are as follows: *Berry*, a fleshy fruit, which is pulpy throughout, and which has a thin skin, or rind. In this case the fruit is a ripened ovary, and common examples are the grape, currant, gooseberry, tomato, etc. *Hesperidium*, a berry with a leathery rind, as the orange and lemon. *Pepo*, a pulpy fruit with a hard rind, as the pumpkin, squash, melon, and the whole race of gourds. *Drupe* or *Stone-fruit*, in which the pericarp ripens in two layers, an outer pulpy one, and an inner stony one, as the peach, plum, cherry, etc. In these cases the pit or stone is often spoken of as the seed, but it invests the seed, which is the kernel. *Drupelet*, a small drupe, as the individual grains of raspberry, blackberry, mulberry, etc. Drupelets are usually aggregated to form a single fruit, as in the illustrations cited. In the raspberry the fruit is simply an aggregation of drupelets; while in the blackberry and mulberry there is associated with the aggregation of drupelets a fleshy axis. *Pome*, a fleshy fruit in which the pulp is the ripened urn-like outgrowth which surrounds the carpels and bears the sepals, petals, and stamens on its rim. Common illustrations are apple, pear, quince, hawthorne, etc. In these cases the modified ovary is the so-called core.

While this classification is fairly complete, it does not include some of the most familiar fruits. For example, the strawberry is a fruit which consists of a very much enlarged and fleshy receptacle, in which are imbedded numerous minute achenes (pits). The banana is a fleshy fruit, but it dehisces by the pericarp splitting into valves, and hence it is often called a fleshy capsule, which is really a contradiction of terms. Almonds are dry fruits, but they are constructed exactly like the peach, except that the pulpy layer of the pericarp in the peach is a fibrous layer in the almond. The almonds of the markets correspond to the stone of the peach, being the hard inner layer of the pericarp, investing the seed or edible kernel. The pineapple is a whole inflorescence, in which axis, bracts, flowers, and all have become a mass of luscious pulp.

Fruits, Food Value of. Fruits are eaten fresh, both raw and cooked, dried or evaporated, canned and preserved. They are frequently divided into a number of classes, the edible fruits being mostly pomes, e.g. apple, pear, etc.; stone-fruit, e.g. cherry, plum, etc.; berries, e.g. blueberry, grape, banana, etc.; aggregate fruits, e.g. strawberry, raspberry, pineapple, etc.; hesperidium, e.g. orange, grapefruit, lemon, etc.; syconium, e.g. fig. A large class of edible fruits, such as tomatoes and melons, are more commonly spoken of as vegetables (q.v.), and another as nuts (q.v.). The following table gives the composition of the more common fresh fruits, as well as of a number of dried or evaporated, and canned or preserved fruits:

COMPOSITION OF EDIBLE PORTION OF FRUITS; FRESH, DRIED, AND PRESERVED

FRUITS	Water	Protein	Fat	Carbohydrates	Ash	Fuel value per pound
FRESH	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories
Alligator pear	81.1	1.0	10.2	6.8	0.9	512
Apple	84.6	.4	.5	14.2	.3	290
Apricot	85.0	1.1	....	13.4	.5	270
Banana	75.3	1.3	.6	22.0	.8	460
Blackberry	86.3	1.3	1.0	10.9	.5	270
Cherry	80.9	1.0	.8	16.7	.6	365
Cranberry	88.9	.4	.6	9.9	.2	215
Currant	85.0	1.5	....	12.8	.7	265
Fig	79.1	1.5	....	18.8	.6	380
Grape	77.4	1.3	1.6	19.2	.5	450
Huckleberry	81.9	.6	.6	16.6	.3	345
Lemon	89.3	1.0	.7	8.5	.5	205
Nectarine	82.9	.6	....	15.9	.6	305
Orange	86.9	.8	.2	11.6	.5	240
Pear	84.4	.6	.5	14.1	.4	295
Persimmon	66.1	.8	.7	31.5	.9	630
Pineapple	89.3	.4	.3	9.7	.3	200
Plum	78.4	1.0	....	20.1	.5	395
Pomegranate	76.8	1.5	1.6	19.5	.6	460
Prune	79.6	.9	....	18.9	.6	370
Raspberry, red	85.8	1.0	....	12.6	.6	255
Raspberry, black	84.1	1.7	1.0	12.6	.6	310
Strawberry	90.4	1.0	.6	7.4	.6	180
Whortleberry	82.4	.7	3.0	13.5	.4	390
DRIED						
Apple	28.1	1.6	2.2	66.1	2.0	1,350
Apricot	29.4	4.7	1.0	62.5	2.4	1,290
Citron	19.0	.5	1.5	78.1	.9	1,525
Currant, Zante	17.2	2.4	1.7	74.2	4.5	1,495
Date	15.4	2.1	2.8	78.4	1.3	1,615
Fig	18.8	4.3	.3	74.2	2.4	1,475
Pear	16.5	2.8	5.4	72.9	2.4	1,635
Prune	22.3	2.1	....	73.3	2.3	1,400
Raisin	14.6	2.6	3.3	76.1	3.4	1,605
Raspberry	8.1	7.3	1.8	80.2	2.6	1,705
PRESERVED						
Apple, Crab	42.4	.3	2.4	54.4	.5	1,120
Apricot sauce	45.2	1.9	1.3	48.8	2.8	1,000
Blackberry	40.0	.8	2.1	56.4	.7	1,150
Peach	88.1	.7	.1	10.8	.3	220
Pineapple	61.8	.4	.7	36.4	.7	715

These figures represent average values; individual specimens will vary greatly from the average. Many fruits contain more or less inedible material or refuse, such as stems, seeds, pit, etc., while others are entirely edible. The inedible portion may be considerable; thus, in oranges the skin and seeds amount to about 27 per cent. In bananas the skin constitutes about 35 per cent. of the fruit as purchased. On the other hand, the inedible portion may be very small. Thus the pits of cherries or the hulls of strawberries constitute about 5 per cent. of the weight of the fruit. It will be seen in general that fruits have a high water content. Carbohydrates, which include starches, sugars, and similar bodies, make up the principal nutritive material. In general, fruits contain very little protein or fat. An exception is the alligator pear, which contains about ten per cent. of fat. The ash content of fruits is also small. The ash is made up of salts of calcium, potassium, magnesium, sodium, etc. For instance, the ash of one sample of cherries, which constitutes about 0.6 per cent. of the total fruit, contained 4.2 per cent. of calcium oxide, 57.7 of potassium oxide, 5.5 of magnesium oxide, 15.1 of phosphoric acid, 6.8 of sodium oxide, and 5.8 of sulphuric acid. The ash of three samples of figs (also constituting some 0.6 per cent. of the total fruit) contained an average of 2.4 per cent. of calcium oxide, 55.8 of potassium oxide, 5.6 of magnesium oxide, 12.4 of phosphoric acid, and 3.9 per cent. of sulphuric acid. In the ash of five samples of grapes (which makes up 0.5 per cent. of the fruit) there was an average percentage of 5 calcium oxide, 50.9 potassium oxide, 3 magnesium oxide, 21.2 phosphoric acid, and 4.3 sulphuric acid.

Dried or evaporated fruits contain much more nutritive material in proportion to their bulk than do the fresh fruits, owing to the fact that, like other dried fruits, they have been concentrated by evaporation. Canned or preserved fruits are, generally speaking, cooked fruits, with or without the addition of sugar. Fruits owe their flavors to the presence of esters, acids, volatile oils, salts, and other chemical bodies. The coloring is due to the presence of erythophyll and other complicated chemical compounds. In food analysis such materials are not estimated separately. The total amount is not large, and such bodies are generally included under the carbohydrates, or, as the group is frequently termed, the nitrogen-free extract. The flavor, appearance, and composition of fruits may be modified by cultivation.

Little is known of the digestibility of fruits, that is, the amount of material which they give up to the body in their passage through the digestive tract. It seems fair to assume that they are quite thoroughly assimilated. Over-indulgence in fruit and the consumption of unripe fruit or of that which is more or less decayed, frequently causes pain or other unpleasant symptoms, and there are persons who, because of personal idiosyncrasy, cannot eat certain fruits without distress. Judging by the results of a large number of dietary studies made in the United States, it appears that fruits furnish 5.6 per cent. of the total carbohydrates and about 1 per cent. of the total food, and 4.9 per cent. of the total protein and fat taken together. In many dietary studies which have been made the cost of foods has been recorded. It has been found that a large consumption of fruits or fresh vegetables, owing to their low food content, increases the cost of the diet out of proportion to the nutritive material furnished.

It must not be forgotten, however, that fruits have value in addition to their nutrient value. They contain salts, acids, and other bodies which are believed by physiologists to have a beneficial effect on the system, and doubtless very often stimulate the appetite for other food. They are also useful in counteracting a tendency to constipation. Another point—and one entirely apart from food value—should not be overlooked. That is, fruits add very materially to the attractiveness of the diet. It is not easy to estimate their value from this standpoint, since often the appearance of food has a value which cannot be measured in dollars and cents. For bibliography, see separate articles on various kinds of fruits.

FRUIT, CULTIVATED. Cultivated fruits exhibit great diversity of form, color, texture, flavor, and keeping quality. All are intimately associated with the flower which precedes their formation, and all find their chief use as food for man. The plants that produce them are adapted to great diversity of climate and soil, and may be divided into three main groups—tropical, subtropical, and temperate—depending upon the temperature they require for their perfect development. The leading fruits of the tropics are date, banana, cocoanut, and pineapple; of the subtropics, orange, lemon, fig, pomelo; of the temperate, apple, grape, plum, olive, peach, pear, cherry, strawberry. All of these contribute largely, not only to the diet of the resident populace, but through export, in either the fresh or the preserved state, to the prosperity of the region in which they grow.

The present commercial importance of cultivated fruits is largely due to the developments of the latter half of the nineteenth century. Prior to that period few fresh fruits other than apples, lemons, oranges, and cocoanuts, and such dried fruits as figs, raisins, and prunes, could be obtained for more than a few consecutive weeks in the general markets of the world, their perishable nature precluding long shipment and exposure previous to sale. During that period the great advances made in quick transportation by sea as well as by land, and the remarkable improvements wrought in methods of canning and evaporating and in holding fresh fruits in edible condition by means of cold storage, have had a wider influence in extending the area devoted to cultivated fruits than improvements in the fruits themselves or in the methods of cultivation. Improved methods of preservation and expeditious transportation have enabled fruit-growers throughout the world to educate the taste and create a demand for fruits in remote regions, with the result that the number of cultivated and even of important wild edible fruits not found either fresh or preserved in the world's principal markets is small indeed, and is becoming steadily smaller. America and Australia ship apples to Europe, which reciprocates by exporting figs, raisins, and the seedless grapes known in commerce as 'currants'; California sends grapes and raisins, citrous fruits, fresh and canned peaches, pears, cherries, and apricots to the States east of the Rocky Mountains; the States bordering the Gulf of Mexico send strawberries, peaches, and other perishable fruits to the North before the Northern season opens; the tropics export bananas, cocoanuts, and pineapples to markets in the temperate zones. Apples, lemons, bananas, and oranges may now be obtained in a fresh state throughout the year, and many other fruits, such as pears, strawberries, grapes, and peaches, that could be obtained for only a few weeks, have had their seasons extended in some instances to as many months. Fruit, fresh or preserved, domestic or exotic, is so generally included in the daily diet of the people of all civilized countries, and the extension of plantations in every country visited by commerce is so active, that the world may be said to be in its fruit age.

If the standing of fruits be determined by the area devoted to each, the consumption of each, and the variety of fruit products of each, the order of sequence in a list of the world's cultivated fruits and their products would probably not vary greatly in a series of years from the following: Apple (evaporated, butter, marmalade, jelly, cider, vinegar, wine, champagne, brandy); grape (wine, vinegar, jelly, argols, or dried as raisins or currants); olive (pickled, oil); lemon; orange (cider, marmalade, candied); cocoanut (dried, oil); banana; peach (canned and dried); plum (canned or dried as prunes); pear (canned, perry); date (dried); fig (dried); strawberry (canned); pineapple (canned); cherry (canned, dried, and candied). If commercial standards, quantity and variety of product, and quick precision in applying scientific discovery and business acumen to fruit-growing and marketing, be employed to determine the standing of a country with respect to its cultivated fruits, the United States stands without a peer; and among the continents, North America ranks first. Immigrants from Europe, who brought with them the fruits of the fatherland, found the land of their adoption to be rich in new kinds of fruits. The dual list begun by them has been swollen by importations from other regions—Asian, African, Australian, and South American—and now far exceeds in number of species that of any other country. All the fruits of the northern temperate zone, many of the southern and the subtropical, and a few peculiarly tropical may be found in some region of the United States. Europe contributed the apple, pear, and cherry; Asia, the peach, plum, orange, fig, and cocoanut; Africa, the date; South America the navel orange, and so on. America has developed many varieties of the following indigenous fruits which she offers in exchange; e.g. blackberry, raspberry, cranberry, dewberry, grapes, and some gooseberries, plums, and apples, besides innumerable improvements in species already highly developed abroad. Yet she has scarcely made more than a beginning; many fruits, such as the persimmon, papaw, buffalo berry, and prickly pear, have as yet attracted little more than temporary interest, but are acknowledged by horticulturists to be rich in promise of possible amelioration. But this remark is true also of fruits of other regions, especially of fruits indigenous to the tropics, where improved methods of propagation and tillage have made slow progress.

Apart from the business side of fruit-growing already touched upon, the improvements made in the fruits themselves and in fruit culture during the last half of the nineteenth century have resulted mainly from the application of scientific discoveries in plant life. These discoveries and the improvements based upon them may be roughly divided into three general but closely related groups: Ecological (the influence of temperature, moisture, wind, air, drainage, soil); physiological (manuring, tilling, mulching, pollenizing, thinning, pruning, hybridizing, and selecting); parasitical and pathological (the control of animal and plant parasites, and of diseases due to organic disturbances). Concerning these, see MANURES AND MANURING; ECOLOGY; DISTRIBUTION OF PLANTS; TILLAGE; PLANT-BREEDING; PRUNING; MULCH; POLLINATION; CROSS-FERTILIZATION; FUNGI, ECONOMICAL; FUNGICIDE; INSECTICIDE; HARVEST AND HARVESTING; IMPLEMENTS, AGRICULTURAL; WINDBREAK; REFRIGERATING MACHINE; and articles on the various fruits. Consult, also: Bailey, *Principles of Fruit-Growing* (New York, 1897); article "Pomology," in *Cyclopedia of American Horticulture* (New York, 1900).

FRUIT, FOSSIL. See CARPOLITH.

FRUIT-BAT. Any fruit-eating bat, especially of the Old World tropical family Pteropodidæ, called fox-bats, or flying foxes. These constitute a suborder, Megacheiroptera, of the bats, based not only upon their large size, but upon distinctive structural features. The wings of fruit-bats have three, instead of one or two, joints in the second or index finger, which is generally provided with a claw, while the thumb alone of other bats possesses one. The ears are small, lack any inner tragus, and the conch forms a ring at its base; the tail, when present, is short, and beneath and free from the membrane between the hind legs. The teeth are unlike those of ordinary bats, particularly in the molars having elongated flat crowns, adapted to crushing pulpy fruits, such as the fig and banana, which constitute nearly the entire diet of the group. These bats are regarded as a specialized offshoot from the ordinary type of insectivorous bats. Consult: Thomas, *Proceedings of the Zoölogical Society of London* (London, 1888). See FOX-BAT; HARPY BAT; TUBE-NOSE.

FRUIT-CROW. A name for several South American birds of the family Cotingidæ, and the genera Gymnocephalus and Gymnodera. They are closely related to the bell-birds and umbrella-birds (q.v.), are crow-like in appearance, and feed upon fruits to a great extent. They possess the baldness or tendency to wattles which characterizes the group, and one or more prominent species are known as 'baldheads.'

FRUIT-FLY. Any small fly of the family Trypetidæ. They are very numerous, and include many species which injure fruit and others that make galls. Most of them are minute, and all are marked with varied colors and spots. Prominent examples are *Trypeta pomonella*, whose larva, the apple-maggot, bores tunnels in apples. (See *Insect Pests* under APPLE.) Another, *Ceratitis capitata*, is highly injurious to peaches in the Old World, but is unknown in America. The Morelos orange-worm (see ORANGE-INSECTS) of Mexico is of this family, and others might be named. Consult: Loew, *Monographs of the Diptera of North America*, parts i. and iii. (Washington, 1862-73); Coquillett, "Descriptions of Trypetidæ," in *Journal of the New York Entomological Society* (New York, 1899). See GALL-INSECTS.

FRUIT-PIGEON. A pigeon of the family Treronidæ. They have the bill considerably depressed at the base, compressed and moderately arched at the tip, the membrane in which the nostrils are pierced little prominent or swollen, the forehead low, and the feathers advancing on the soft part of the bill, the wings moderately long, the feet, and particularly the hinder claw, large, and formed for grasping. During the breeding season a curious gristly knob grows on the base of the upper mandible of some of the species, and soon after disappears. They are birds of splendid plumage, natives of the forests of India, the Indian Archipelago, the warmer parts of Australia, the islands of the Pacific Ocean, and one species is found in Africa. There are about 80 species altogether, most of them contained in the genera Carpophaga and Treron. Their food consists of fruits, which are swallowed whole.

FRUMENTIUS, frōō-mĕn′shĭ-us, SAINT. The apostle of the Abyssinians. About 316 he and his brother Edesius, both young boys, accompanied their uncle Meropius, a Greek philosopher of Tyre, on a trading voyage, or, according to others, a scientific expedition. Landing on the coast of Abyssinia, all were slain by the natives except the two boys, who became slaves in the service of the King. They won the confidence of their master, were raised to important positions, and ultimately were set free. After the death of the monarch, Frumentius became instructor to the young prince Aizanes, and obtained great influence in the administration of State affairs. He formed a church of native converts and Christian merchants who came to the country. After the prince attained his majority, Edesius returned to Tyre, and became a presbyter. Frumentius went to Alexandria, and informed Athanasius, who had lately been nominated bishop, of the progress he had made in preparing the way for Christianity in Abyssinia, and was consecrated Bishop of Axum (328). After his return he baptized the King and made many converts. He is supposed to have translated the Bible into Ethiopian. Frumentius's day is celebrated by the Latins on October 27th, by the Greeks on November 30th, and by the Abyssinians on December 18th. See ABYSSINIAN CHURCH.

FRUNDSBERG, frōōnts'bĕrk, or **FRONSPERG**, frôn'spĕrk, GEORG VON (1473-1528). A German soldier, called the "Father of the German *Landsknechte*" (foot-soldiers or pikemen). He was born at the Castle of Mindelheim, Swabia, and received his military training in the wars of the House of Hapsburg against Switzerland, and in the Italian campaign between the League of Cambrai and Venice. In 1519 he was appointed commander-in-chief of all the infantry troops of the Swabian League. He also fought with distinction at the battle of Pavia (1525), and contributed greatly to the development of the famous German *Landsknecht*, a military body which continued to take a prominent part in the European campaigns until the termination of the Thirty Years' War.

FRUS'TUM. See CONE.

FRY, Sir EDWARD (1827—). An English jurist, born at Bristol, and educated at the college there and at University College, London. He was appointed judge of High Court, Chancery Division, in 1877, and was knighted in the same year. He was judge of the Court Appeal from 1883 to 1892, and in 1897 was president of the Royal Commission on the Irish Land Acts. In 1901 he became a member of the Permanent Court of Arbitration at The Hague. In his writings he displays considerable versatility: *Essays on the Accordance of Christianity with the Nature of Man* (1857); *A Treatise on the Specific Performance of Contracts* (3d ed. 1892); *British Mosses* (1892); *The Mycetozoa* (with Miss Agnes Fry, 1899); *Studies by the Way* (1900).

FRY, ELIZABETH (1780-1845). An English Quaker minister and prison reformer, born at Earlham, Norfolk, daughter of John Gurney. As a child of fifteen, Elizabeth Fry became deeply interested in the house of correction at Norwich. In 1813 she first became practically engaged in prison reform, and turned her attention to the condition of women prisoners at Newgate. Under her leadership an association was formed in 1817 for the improvement of these unfortunates, and did much to better their condition materially and morally. Mrs. Fry also joined in the movement to induce the Government to make proper regulations for the voyage of convicts, at that time transported to New South Wales, and to make provision for their employment at the end of their voyage. She extended her activities throughout England, traveled from place to place, and founded prison associations. Her work attracted attention in other countries also; and contributed materially to prison reform on the Continent. She wrote several works of minor importance. For the story of her life, consult the *Memoirs*, edited by her two daughters (2 vols., London, 1847); *Memoirs*, by Thomas Thompson (London, 1847); a *Life*, compiled from her journal by Susanna Corder (London, 1853); Timpson, *Memoirs of the Life of Mrs. Fry* (London, 1847).

FRY, JAMES BARNET (1827-94). An American soldier. He was born in Carrollton, Ill.; graduated at West Point in 1847, served for a time as assistant instructor of artillery there, was stationed successively in Oregon, Louisiana, and Texas, was instructor at West Point in 1853-54, and was adjutant of the Academy from 1854 to 1859. In March, 1861, he was appointed Assistant Adjutant-General, and later in the year acted as chief of staff to General McDowell. In 1862 he held a similar position under General Buell. He was then Provost-Marshal-General of the United States, with the staff rank of brigadier-general from March, 1863, until August, 1866, when this office was abolished. He subsequently served as Adjutant-General, with the regular rank of colonel, in the divisions of the Pacific, the Missouri, and the Atlantic, until 1881, when he retired. In July, 1866, he was brevetted major-general, and in June, 1868, brigadier-general. He published: *A Sketch of the Adjutant-General's Department, United States Army, from 1775 to 1875* (1875); *History and Legal Effects of Brevets in the Armies of Great Britain and the United States, from Their Origin in 1692 to the Present Time* (1877); *Army Sacrifices* (1879); *Operations of the Army Under Buell* (1884); *McDowell and Tyler in the Campaign of Bull Run* (1884); *New York and Conscription* (1885); *Military Miscellanies*, and *The Conkling and Blaine-Fry Controversy in 1866* (1893).

FRY, WILLIAM HENRY (1815-64). An American composer, journalist, and critic. He was born in Philadelphia, where his father, William Fry, was the proprietor of the *Philadelphia National Gazette*. He studied harmony under Meignen, and in 1835 the Philadelphia Philharmonic Society performed his first orchestral compositions, which consisted of four overtures. Ten years later he produced the opera *Leonora*, which was given in Philadelphia and New York; and in 1863 *Notre Dame de Paris*. He was the composer of several Church pieces, which have been much used. After six years in Paris as a newspaper correspondent, he returned to New York, and lectured upon the history and science of music. Besides his connection with his father's paper, he undertook the editorship of the *Philadelphia Ledger* in 1844. On his first return to New York, he joined the staff of the *Tribune* as musical editor, retaining the position up to his death, which occurred at Santa Cruz, W. I.

FRYE, WILLIAM PIERCE (1831—). An American legislator, born in Lewiston, Maine. He graduated at Bowdoin College in 1850, and after studying law in the office of William Pitt Fessenden, practiced his profession at Rockford and later at Lewiston. He was a member of the State Legislature in 1861-62, was a Presidential elector on the Lincoln ticket in 1864, and was again a member of the Legislature in 1866-67, serving at the same time as Mayor of Lewiston. In the fall of 1867 he was elected Attorney-General of the State, holding the office from 1867 to 1870. In 1871 he was elected to the National House of Representatives, and was reëlected five times, resigning his seat in 1881 to accept a seat in the United States Senate, to which he was promoted to fill the vacancy caused by the resignation of James G. Blaine to enter Garfield's Cabinet as Secretary of State. He was elected for the full term in 1883, and was reëlected in 1889, 1895, and 1901. He was elected president *pro tempore* of the Senate in 1896, and has twice been called upon to act as the permanent presiding officer of that body—after the death of Vice-President Hobart, in 1899, and again after the elevation of Vice-President Roosevelt to the Presidency in 1901. In 1898, after the close of the Spanish War, Senator Frye was a member of the Peace Commission at Paris. He has had a great influence on national legislation, his services as chairman of the important Committee on Commerce, in which capacity he has framed the legislation and proposed legislation in regard to American shipping, being particularly notable.

FRYING. See COOKERY.

FRYKEN, frụ′ken. A series of small lakes in the southern part of Sweden, north of Lake Wenern, and famed for beautiful scenery. They are arranged in three main groups, and are connected by narrow channels, the whole forming a river of irregular width.

FRYXELL, frụks′el, ANDERS (1795-1881). A Swedish historian. He was born at Edsleskog in Dalsland, and after studying at the University of Upsala became in 1819 instructor at the Djurgardskole in Stockholm, from which he went in 1822 to the Maria-Skole in the same city. From 1828 to 1836 he was rector of that institution. His interest lay chiefly in questions of public education. In 1835 he became pastor at Sunne, and in 1836 Bishop of Northern Wermland. From 1847 till his death, March 21, 1881, he devoted himself exclusively to historical research. His great work is the *Berättelser ur Svenska historien*, "Contributions to Swedish History" (46 vols., 1823-79), dealing with the history of his country till 1771. These narratives are marked not only by their patriotic sentiment, but by their fresh and natural conception, their richness of biographic detail, and their naïve and vivacious style. They possess, too, the faults of their kind, and have been criticised for their diffuseness and lack of critical insight. The *Berättelser* have nevertheless become a national classic. His *Characteristics of the Period from 1592 to 1600 in Sweden* (1831) received the grand prize of the Swedish Academy. Between 1845 and 1850 he published *Om aristokrat-fördömandet i Svenska historien*, "The Rôle of the Aristocracy in Swedish History." This was in the nature of a defense of the Swedish nobility, and brought upon him the hatred of the Liberal element in Sweden. Fryxell's minor works include: *Handlingar rögrande Sveriges historien*, "Studies in Swedish History" (1836-43); and *Bedrag till Sveriges litteratur-historia*, "Contributions to the History of Swedish Literature" (1860-62). His autobiography, *Min historias historia*, appeared at Stockholm in 1884.

F.'S AUNT, MR. A character in Dickens's *Little Dorrit*. She was left to Mrs. F. by her husband as a not very acceptable legacy.

FUAD PASHA, fōō′äd pȧ-shä′ (1814-69). A Turkish statesman and scholar, born in Constantinople. He was the son of the poet Izzet Mollah, and nephew of Leila Khatun, one of the very few Turkish poetesses. He studied medicine at Galata-Serai from 1828 to 1832. In 1834 he was appointed Admiralty physician, and accompanied the Grand Admiral in his expedition against Tripoli. On his return to Constantinople he forsook medicine and entered the Bureau of Interpreters for the Porte. In 1840 he became First Secretary to the Turkish Embassy at London, and served in various diplomatic positions until in 1848 he was appointed Grand Interpreter to the Porte. In 1850 he went on a mission to Saint Petersburg, and in 1853 on another to Egypt. On his return from the first of these he became Minister of Foreign Affairs under the Grand Viziership of Aali Pasha. In 1854 Fuad went to Epirus along with Omer Pasha, where he suppressed the insurrection with great energy. In the following year he received the title of pasha, and was again appointed Minister of Foreign Affairs, and represented Turkey at Paris in the regulation of the affairs of the Danubian Principalities. In 1860 he was sent to Damascus in consequence of the disorders in the Lebanon. (See DRUSES.) In 1861 he held the office of Grand Vizier. In 1862 he became Minister of Finance, and in 1867 again Minister of Foreign Affairs. He died in 1869. When the Turkish Academy of Science and Belles-Lettres was established, in 1851, Fuad became one of the first members, and in the following year he published a Turkish grammar, which is highly esteemed by native scholars. He also wrote a poem on the Alhambra. He received many honors and decorations from European sovereigns.

FUCA, fōō′kȧ, JUAN DE (?-1602). A Greek navigator, whose real name was Apostolos Valerianos. He was born in Cephalonia, and is celebrated as the discoverer of the straits named after him, and separating the island of Vancouver from Washington and connecting the Pacific with the Gulf of Georgia. Little is known of his career, except that he served for more than thirty-five years in the East Indies as a pilot in the Spanish Navy, and that in 1596 he applied for admission to the English service. In his report he claims to have discovered a strait uniting the Pacific with the Atlantic.

FUCA, JUAN DE, STRAIT OF. A passage separating the State of Washington, in the United States, from Vancouver Island. It connects the Pacific Ocean with the Strait of Georgia on the north and Puget Sound on the south, having its outer, or western, entrance in latitude 48° 30′ N. and longitude 124° 40′ W. (Map: Washington, A 1). It is important as the water route from Vancouver and the Puget Sound cities to the Pacific Ocean. It is about 100 miles long from east to west, and about 15 miles wide in the western part; but expands to double that width in the eastern section. It contains several islands in its eastern part, one of which (San Juan) became the subject of a dispute between Great Britain and the United States, the question being whether it was to be regarded as an appendage of Washington Territory or of British Columbia. The question was submitted in 1872 to the Emperor of Germany as arbiter, and he decided that the line of boundary should be run through the Strait of Haro, west of San Juan, thus awarding that island to the United States.

FU-CHAU, fo͞o′chou′. See Fu-chow.

FU-CHOW, or **FOO-CHOW** (Chin., Happy Region). A walled city of China, capital of the Province of Fu-kien, and one of the five ports opened to foreign residence and trade by the treaty negotiated by the British at Nanking in 1842. The name is also sometimes spelled Fuh-chow, Fuh-chau, Foo-choo, and Fu-chou, and sometimes has appended to it the syllable fu, or foo, meaning 'department' or 'departmental city.' In the local dialect it is pronounced Hok-chiu.

Fu-chow is well situated in a beautiful and fertile plain, 34 miles from the mouth of the river Min, and about two miles back from the north bank of the northern branch of the river, opposite the long, narrow island called Nan-t'ai. Its walls, which have a circuit of about 6½ miles, and are pierced with seven massive gates, surmounted with lofty towers, inclose three finely wooded hills—'Black Rock Hill,' in the southwest angle; the 'Hill of the Nine Genii,' in the southeast; and 'Screen Hill,' in the northeast. The eastern part of the inclosure is known as the Tatar town, a garrison having been established here by the conquering Manchus in the seventeenth century. The principal street of the city runs from north to south, and is continued through the south gate by a long causeway to and through the city's most populous and most important suburb on the river bank. From this point a celebrated stone bridge—the 'Bridge of Ten Thousand Ages'—leads across the river to a densely peopled little island, Tong-chiu ('Middle Island'), and from this island another stone bridge 300 feet in length completes the line of communication with the foreign settlement on the island of Nan-t'ai. The Bridge of Ten Thousand Ages is said to have been built over eight centuries ago. It is 1350 feet long, about 14 feet in width, and is formed of a granite causeway laid upon thick stone slabs 45 feet long, which rest on about 40 immense stone piers. Strong stone parapets mortised into large stone pillars protect pedestrians. This is the limit of navigation for sea-going junks; but barges and smaller craft with movable masts may pass under the bridge. Foreign vessels, except those of very light draught, anchor ten miles lower down, off a small island with a pagoda on it, which lies off the lower end of Nan-t'ai Island.

Near here, on the left bank of the river, are the arsenal and navy-yard, established in 1867, and managed by Frenchmen. Many war vessels have been launched here, and most of the naval officers of China were trained in the school of navigation attached to the arsenal. In 1884, during hostilities with France, the arsenal and the fortifications in the neighborhood suffered greatly from a brief bombardment by the French. There is also a dry-dock, 300 feet long, with powerful pumps and steel caissons.

Cotton-mills, with special concessions from the Government, have been established here, and more recently a match-factory. The mint is now issuing one-cent, ten-cent, and twenty-cent pieces, which are gradually finding their way over the country. Among the other articles produced are 'soapstone' or steatite figures, vases, and other ornamental objects, artificial flowers, and figures of birds carved in charcoal and colored to represent the living originals. Fu-chow lacquer is also well known.

Fu-chow was opened to foreign commerce in 1842, but it was not until 1853 that the tea trade of the port began to assume any importance. Since 1880 it has dwindled greatly. In 1900 the net value of the trade of the port was $11,045,800, of which $3,889,490 represented native produce of local origin sent to foreign countries; $1,166,030 native produce of local origin sent to Chinese ports; and $1,926,835 native produce imported chiefly from Shanghai. In the same year the gross value of foreign imports—that is, including reëxports—was $4,088,560, of which goods to the value of $3,476,560 came from foreign countries or through Hong Kong, and the rest from Chinese ports. The chief articles imported from foreign countries were opium, cotton goods, lead, tin, tinplate, steel, kerosene oil, machinery, flour, and sugar, and the chief exports were timber, wood for kerosene-oil cases, tea, canes, matches, and various kinds of fruit.

The shipping returns show that 291 steamers, with a tonnage of 351,661 tons, entered inward, the different nationalities being represented as follows:

	Steamers	Tons
British	174	249,908
United States	3	2,386
German	15	38,660
Dutch	1	1,958
Swedish and Norwegian	5	8,027
Russian	1	542
Japanese	50	15,537
Chinese	42	34,643

The port is now connected by telegraph with the principal cities of China, and by cable with Formosa, Hong Kong, and Europe.

Fu-chow is the residence of the Governor of Fu-kien Province, and of the Viceroy, or Governor-General, of the united provinces of Che-kiang and Fu-kien, officially known as Che-Min, Min being the ancient name of this region.

The population of the city, including its seven suburbs, has been estimated at 636,000.

Bibliography. For a good description of the city, see Doolittle, *Social Life of the Chinese* (New York, 1867), and Mayer and others, *The Treaty Ports of China and Japan* (London, 1867). For statistics, consult: The annual reports of the Imperial Maritime Customs of China, and *Commercial China in 1899*, issued by the United States Treasury Department Bureau of Statistics (Washington, D. C.). For the language, consult: Maclay, *Manual of the Foo-chow Dialect*, and Maclay and Baldwin, *Chinese-English Dictionary* (1871).

FUCHS, fo͞oks, Ernst (1851—). A German ophthalmologist. He was born and educated at Vienna, and after holding a professorship at the University of Liège (1881-86) was appointed to the chair of ophthalmology at the University of Vienna. His principal publications, most of which are translated into German and French, include: *Das Sarcom des Uvealtractus* (1882); *Die Ursachen und die Verhütung der Blindheit* (1885); *Lehrbuch der Augenheilkunde* (1889).

FUCHS, Immanuel Lazarus, also called Ludwig (1833-1902). A German mathematician, born at Moschin, in Posen. After teaching mathematics in several institutions, he became professor extraordinary at Berlin in 1866, and full professor of mathematics at Greifswald in 1869, at Göttingen in 1874, at Heidelberg in 1875, and at Berlin in 1884. His principal contributions bear upon the theory of functions and the theory of linear differential equations. After Kronecker's death, in 1891, he became editor of the *Journal für die reine und angewandte Mathematik.* His name has been connected by Poincaré with a discontinuous group ('Fuchsians') which is very important in the general theory of functions, and is frequently discussed by Poincaré in the volumes of *Acta Mathematica* (Stockholm).

FUCHS, Johann Nepomuk von (1774-1856). A German chemist and mineralogist. He was born at Mattenzell, studied at Freiberg, Berlin, and Paris, was professor at Landshut and Munich, and was curator of the mineralogical collection and a member of the Academy at Munich. He published a number of interesting papers on chemistry, mineralogy, and crystallography, and his *Gesammelte Schriften* were published at Munich in 1856. He is known for his process of making a soluble glass used in fixing fresco colors.

FUCHS, Konrad Heinrich (1803-55). A German physician, born at Bamberg, and educated at Würzburg. He was professor of pathology and therapy at Göttingen from 1838 until his death, and wrote the important work entitled *Lehrbuch der speziellen Nosologie und Therapie* (1844-48). He also published an edition of the earliest writers on syphilis in Germany, *Die ältesten Schriftsteller über die Lustseuche in Deutschland* (1843). The pathologico-anatomical collection at the University of Göttingen was founded by him.

FUCHS, or **FUCHSIUS,** fo͞ok′sê-o͞os, Leonhard (1501-66). A celebrated German botanist. He was born at Wembdingen, in Bavaria, studied at Ingolstadt, under Reuchlin, and in 1535 became professor of medicine at Tübingen. He published a number of excellent works on botany, the most important of which is his beautifully illustrated *De Historia Stirpium Commentarii Insignes* (1545). This is one of the books with which the modern science of botany began to exist. The fanciful speculations of the Middle Ages were abandoned, and men began to study the facts and phenomena of real nature. Fuchs described with great clearness a large number of plants, and even endeavored to establish a rational system of nomenclature. He is justly known as one of the fathers of scientific botany.

FUCHSIA (Neo-Lat., named in honor of Leonhard Fuchs). A genus of plants of the natural order Onagraceæ, which contains about 70 species, mostly natives of tropical America. Some are climbers, some small trees, but the majority are shrubs or half-shrubby herbs. The leaves are opposite. The flowers, which are solitary and axillary, or sometimes arranged in terminal racemes, are generally pendulous, have a funnel-shaped, four-cleft, finely colored calyx, a four-petaled, usually red, corolla, and a four-celled berry, which in some species is edible. Several species are largely employed as greenhouse plants, and in climates not too rigorous they are grown out of doors with slight protection during the cold season. They are deservedly popular, because they yield a satisfactory display of bloom with less care in propagation and management than almost any other house plant, and in consequence of their beauty and gracefulness, they have developed a great number of varieties, not only of the colors and forms they possess in nature, but others, such as white and double, which are not peculiar to the species from which they originate. *Fuchsia macrostemma*, a very variable Chilean species, first attracted European attention about 1790, and for about seventy-five years usurped both name and fame of *Fuchsia coccinea*, which is considered a more attractive and free-blooming species. It has been largely employed, either singly or in crossing with *Fuchsia fulgens*, in the production of cultivated forms. See Bailey, *Cyclopedia of American Horticulture* (New York, 1900).

FUCINO, fo͞o-chē′nô, Lake. A former lake in Italy, the ancient Lacus Fucinus, now a vast fertile farm (Map: Italy, H 6). For history of its drainage, see Avezzano.

FUDGE FAMILY IN PARIS, The. A skit by Thomas Moore (1818), satirizing the underbred English in foreign countries. The satire was followed by a sequel, *The Fudge Family in England.*

FUEGIAN, fû-ē′jĭ-*a*n. See Aliculuf; Ona; Yahgan.

FUEL (OF. *fouailles,* from ML. *focale,* fuel, from Lat. *focus,* hearth). Any material that is capable of being utilized for the heat it produces upon union with oxygen. (See Combustion.) The fuel of greatest economical importance is coal. Many other substances are, however, rated very high commercially and industrially as fuels. Some of these substances, such as wood, peat, and crude petroleum, are of natural origin; others, such as coke, charcoal, and coal-gas, are formed artificially. A useful classification of fuels is that which divides them according to their state of aggregation, and this classification will be followed in the present article. To enumerate: The principal solid fuels are coal, peat, coke, charcoal, and wood; the liquid fuels include petroleum, shale oils, and vegetable and animal oils; the gaseous fuels include coal-gas, producer gas, water-gas, mixed gas, and natural gas. The heat of combustion—i.e. the heat generated by the combustion of a certain quantity in oxygen — measures the 'calorific power' or 'heat value' of a fuel. However, the terms calorific power and heat value have, in common usage, a slightly wider significance than the term 'heat of combustion.' The latter term is applied only to the quantity of heat generated by the substance when completely burned—that is, when the carbon and hydrogen are completely changed to carbonic acid and water. The terms 'calorific power' and 'heating value,' on the contrary, apply to the measure of an industrial yield as well as to the heat given off by the fuel during its complete combustion. Scientifically, the term 'heat of combustion' is the most nearly correct. The units of measure of the quantity of the heat of combustion are the *calorie* and the *British thermal unit.* The calorie is the quantity of heat required to raise the temperature of one kilogram of water one degree centigrade. The British thermal unit (usually abbreviated, B. T. U.) is the quantity of heat required to raise the temperature of one pound of pure water one degree Fahrenheit.

There are two methods for finding the heat of combustion of substances: (1) Calculation based on chemical composition, and (2) experimental determination by means of a calorimeter. By the first method the units may be calculated directly from the composition of the substance, or calculation of the heat of combustion from the composition of the substance, or indirectly from the quantity of oxygen consumed during combustion in a crucible. The direct calculation of the heat of combustion from the chemical composition of the fuel is usually performed by means of Dulong's formula. Other general formulas are in use, but they all resemble Dulong's, and are usually only modifications of his. Dulong's formula, with recent average figures for the constants, as given by Mr. William Kent, for coal, is: Heating value per pound in B. T. U. equals $\frac{1}{100}$ $[14{,}650\ C + 62{,}000 \left(H - \frac{O}{8}\right) + 4000\ S]$, in which C, H, O, and S are respectively the percentages of carbon, hydrogen, oxygen, and sulphur in the coal. Mr. Kent points out, as the result of a comparison of numerous data, that the relation of the heat of combustion of coal to its ultimate analysis is expressed by Dulong's formula with remarkable accuracy—that is, within a limit of error of usually less than 2 per cent. The method of calculating the heat of combustion indirectly, from the quantity of oxygen consumed, is also expressed by a general formula; but this formula has been shown to be of very questionable value, and is now used only where no other methods of determination are possible.

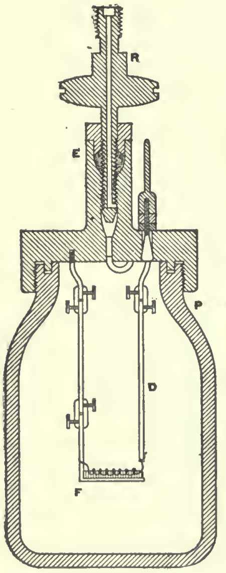


FIG. 2. SECTION OF COMBUSTION CHAMBER OF MAHLER CALORIMETER.

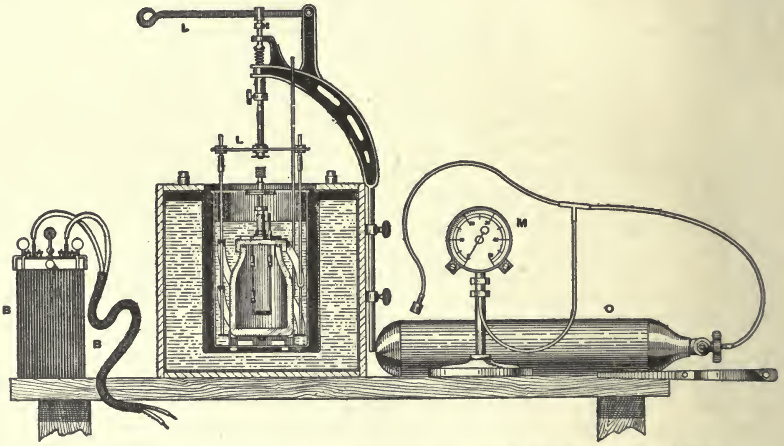


FIG. 1. MAHLER CALORIMETER FOR MEASURING THE HEATING VALUE OF FUEL.

It is generally conceded that the ultimate test of the heat of combustion of a fuel is its determination by actual combustion in a calorimeter. Calorimeters are made in various forms, but they all consist of a combustion-chamber in which the sample of fuel is burned, surrounded by a chamber containing a known quantity of water, whose rise of temperature is shown by a thermometer. The Mahler calorimeter (one of the most perfect of such devices) is shown in the accompanying engravings, of which Fig. 1 shows the apparatus complete with its accessories, and Fig. 2 shows the combustion-chamber, or bomb, separated from the other apparatus. The combustion-chamber (Fig. 2) consists first of a steel shell, P, and a stopper or cover, E. The shell has a capacity of 40 cubic inches, is nickeled on the outside, and has a coating of enamel on the inside. The stopper E screws down tightly into the shell, and is made of iron. It carries a stop-cock, R, of fine nickel, and through its top passes an insulated electrode, D, reaching the interior by a platinum wire. Another platinum wire, suspended from the cover, carries a disk, F, on which the fuel is placed. The bomb is supported inside a cylindrical vessel so as to be surrounded by water, as shown by Fig. 1. In this illustration, L is a pump-like mechanism for agitating the water surrounding the bomb; O is a cylinder containing oxygen under pressure; M is a pressure-gauge; and B is an electric battery. The manipulation of the apparatus and the fuel in making a test is substantially as follows: Weigh one grain of the fuel to be tested and place it on the disk F; then make connection between the electrode D and the disk F; screw down the cover E; put the stop-cock R in connection with the oxygen cylinder O, and open it carefully, so as to allow sufficient oxygen to pass into the bomb for the required pressure; close the cock of the oxygen-chamber, then the cock R, and then disconnect the oxygen-chamber; place the bomb in the water-chamber, and adjust the agitator L and the thermometer; pour in the previously weighed water, and operate the agitator a few minutes to restore equilibrium of temperature; note the thermometer; connect the electrode with the battery, and thus kindle the fuel; read the thermometer one-half minute after kindling, then at minute intervals until the readings begin to decrease regularly; next open the cock R, and afterwards the bomb, which should be washed inside with distilled water to collect the acids formed, and determine the acids volumetrically. The mode of procedure described furnishes all the data to be obtained by the test proper; the observer then proceeds to calculate the heat of combustion from these data. This calculation is a rather formidable one, and the interested reader should consult special treatises on calorimetry for its explanation. The result obtained is the heat of combustion expressed in terms of calories or of British thermal units. (See HEAT; THERMO-CHEMISTRY.) When coal is the fuel tested, it is reduced to moderately coarse powder before being placed on the disk. Heavy oils, tars, etc., are weighed directly onto the disk. Volatile oils are inclosed in pointed glass bulbs, which are placed on the disk, and the ends of which are broken off just before closing the bomb. Gases are simply pumped into the bomb. A calorimetric test, in order to give reliable results, requires expert manipulation and extreme care.

TABLE I.—CLASSIFICATIONS OF COALS ACCORDING TO THE RELATIVE PERCENTAGE OF CARBON AND VOLATILE MATTER

KINDS OF COAL	Per cent. fixed carbon	Per cent. volatile matter	Heating value B. T. U. per lb.	Relative combustible value
Anthracite	97 to 92½	3 to 7½	14,600 to 14,800	93
Semi-anthracite	92½ " 87½	7½ " 12½	14,700 " 15,000	94
Semi-bituminous	87½ " 75	12½ " 25	15,500 " 16,000	100
Bituminous, Eastern	75½ " 60	25 " 40	14,800 " 15,200	95
" Western	65 " 50	35 " 50	13,500 " 14,800	90
Lignite	under 50	over 50	11,000 " 13,500	77

SOLID FUELS. Of the solid fuels used at present, coal is by all odds the most important. Coal is a very varied product, and its value as a fuel is correspondingly variable. According to geologists, a bed of coal was many ages ago a mass of damp vegetable fibre, a portion of a peat-bog. Through successive geologic ages the peat-bog was submerged and overlaid with mud and glacial drift, tilted and compressed by upheavals of the earth's crust, and subjected to intense heat. During these processes it underwent a more or less complete destructive distillation. The conditions under which this distillation took place were not uniform; the variable factors were time, depth, and porosity of the overlying strata, pressure and temperature, disturbance of the beds, and the intrusion into them of mineral substances, such as clay, sand, iron, and sulphur. As a consequence, the product of the distillation—namely, coal—varies all the way from the original peat, through brown coal or lignite, bituminous, semi-bituminous, semi-anthracite, and anthracite, to graphitic coal. Graphitic coal has nearly all the volatile hydrocarbon gases and oxygen driven off from it, leaving practically only fixed carbon and ash, the carbon being in a form so hard to burn that the coal is not used as a commercial fuel. Lignite is at the extreme opposite end of the scale of coals, it being only one remove from the original peat—that is, the proportion of fixed carbon is small, and the proportion of volatile matter large. Between these two extremes come the other classes of coal. To summarize, we thus have different varieties of coal, due to differences in the extent to which the volatile gases have been driven off from the original peat or other woody coal-forming substance. There are also differences in quality in each variety, due to varying percentages of ash and water. The ash or earthy matter in coal ranges from 2 to over 30 per cent.; the water ranges from less than 1 per cent. in the anthracites up to 14 per cent. or more in some of the bituminous coals, and to 25 per cent. or more in some of the lignites. The importance of stating the preceding circumstances lies in the fact that they determine the relative heating value of the different coals for fuel. An illustration will explain this truth. Coal is composed of four different substances, which may be separated by proximate analysis—namely, fixed carbon, volatile hydrocarbon, ash, and water. When coal is burned the moisture is first driven off at a temperature of 250° to 300° F.; then the volatile matter is driven off at a red heat; then the carbon is burned out of the remaining coke at a white heat, until nothing is left but ash. The fixed carbon has a constant heating value of about 14,600 B. T. U. per pound. The heat value of the volatile hydrocarbon depends on its composition, and that depends chiefly upon the district in which the coal is mined. It may be as high as 21,000 B. T. U. per pound in the best bituminous coals containing very little oxygen, or as low as 10,000 B. T. U. per pound in some of the poorest bituminous coals having a high percentage of oxygen. The ash has no heating value, and the water has in effect less than none, for its evaporation and the superheating of the steam made from it to the temperature of the chimney gases absorb some of the heat generated by the combustion of the fixed carbon and the volatile matter. The heating value per pound varies in different districts, and bears a relation to the percentage of volatile matter. It is the highest in the semi-bituminous coals, being nearly constant at 15,750 B. T. U. per pound; it is between 14,500 and 15,000 B. T. U. in anthracite, and ranges from 15,000 B. T. U. down to 13,000 B. T. U. or less in the bituminous coals, decreasing usually as we go westward, and as the volatile matter contains an increasing percentage of oxygen, as shown by Table II. Tables I. and II. refer only to American coals, and they will be understood clearly if studied in connection with the preceding discussion, with the exception possibly of the last column of Table II. This column has been inserted to show the relative theoretical value of the different coals for evaporating water from 212° F. to steam at 212° F. The following general figures of the heating value of foreign coals give a basis for a rough comparison between American and foreign products:

COUNTRY	Heating value in B. T. U.
Chile	11,758 to 14,954
France	15,030 " 16,560
Great Britain	14,000 " 15,955
Austria-Hungary	12,213 " 15,131
Germany	11,045 " 15,847
Spain	9,556 " 14,113
Russia	8,748 " 15,665
New Zealand	9,846 " 15,364

These values are the maximum and minimum in each case from a large number of tests. The purposes for which different kinds of coal are

TABLE II.—SHOWING PROXIMATE ANALYSES AND HEATING VALUE OF AMERICAN COALS

	Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Heating value per lb. coal, heat units	Volatile matter per cent. of combustible	Heating value per lb. combustible, heat units	Theoretical evaporation lbs. water from and at 212° per lb. combustible
ANTHRACITE									
Northern coal field	3.42	4.38	83.27	8.20	.73	13,160	5.00	14,900	15.42
East Middle coal field	3.71	3,08	86.40	6.22	.58	13,420	3.44	14,900	15.42
West Middle coal field	3.16	3.72	81.59	10.65	.50	12,840	4.36	14,900	15.42
Southern coal field	3.09	4.28	83.81	8.18	.64	13,220	4.85	14,900	15.42
SEMI-ANTHRACITE									
Loyalsock field	1.30	8.10	83.34	6.23	1.63	13,920	8.86	15,500	16.05
Bernice basin	.65	9.40	83.69	5.34	.91	13,700	10.98	15,500	16.05
SEMI-BITUMINOUS									
Broad Top, Pa	.79	15.61	77.30	5.40	.90	14,820	17.60	15,800	16.36
Clearfield County, Pa	.76	22.52	71.82	3.99	.91	14,950	24.60	15,700	16.25
Cambria County, Pa	.94	19.20	71.12	7.04	1.70	14,450	22.71	15,700	16.25
Somerset County, Pa	1.58	16.42	71.51	8.62	1.87	14,200	20.37	15,800	16.36
Cumberland, Md	1.09	17.30	73.12	7.75	.74	14,400	19.79	15,800	16.36
Pocahontas, Va	1.00	21.00	74.39	3.03	.58	15,070	22.50	15,700	16.25
New River, W. Va	.85	17.88	77.64	3.36	.27	15,220	18.95	15,800	16.36
BITUMINOUS									
Connellsville, Pa	1.26	30.12	59.61	8.23	.78	14,050	34.03	15,300	15.84
Youghiogheny, Pa	1.03	36.50	59.05	2.61	.81	14,450	38.73	15,000	15.53
Pittsburg, Pa	1.37	35.90	52.21	8.02	1.80	13,410	41.61	14,800	15.32
Jefferson County, Pa	1.21	32.53	60.99	4.27	1.00	14,370	35.47	15,200	15.74
Middle Kittanning seam, Pa	1.81	35.33	53.70	7.18	1.98	13,200	40.27	14,500	15.01
Upper Freeport seam, Pa. and Ohio	1.93	35.90	50.19	9.10	2.89	13,170	43.59	14,800	15.32
Thacker, W. Va	1.38	35.04	56.03	6.27	1.28	14,040	39.33	15,200	15.74
Jackson County, Ohio	3.83	32.07	57.60	6.50	....	13,090	35.76	14,600	15.11
Brier Hill, Ohio	4.80	34.60	56.30	4.30	....	13,010	38.20	14,300	14.80
Hocking Valley, Ohio	6.59	34.97	48.85	8.00	1.59	12,130	42.81	14,200	14.70
Vanderpool, Ky	4.00	34.10	54.60	7.30	....	12,770	38.50	14,400	14.91
Muhlenberg County, Ky	4.33	33.65	55.50	4.95	1.57	13,060	38.86	14,400(?)	14.91
Scott County, Tenn	1.26	35.76	53.14	8.02	1.80	13,700	34.17	15,100(?)	15.63
Jefferson County, Ala	1.55	34.44	59.77	2.62	1.42	13,770	37.63	14,400(?)	14.91
Big Muddy, Ill	7.50	30.70	53.80	8.00	....	12,420	36.30	14,700	15.22
Mount Olive, Ill	11.00	35.65	37.10	13.00	....	10,490	47.00	13,800	14.29
Streator, Ill	12.00	33.30	40.70	14.00	....	10,580	45.00	14,300	14.80
Missouri	6.44	37.57	47.94	8.05	....	12,230	43.94	14,300(?)	14.80
LIGNITES AND LIGNITIC COALS									
Iowa	8.45	37.09	35.60	18.86	....	8,720	51.03	12,000(?)	12.42
Wyoming	8.19	38.72	41.83	11.26	....	10,390	48.07	12,900(?)	13.35
Utah	9.29	41.97	44.37	3.20	1.18	11,030	48.60	12,600(?)	13.04
Oregon Lignite	15.25	42.98	33.32	7.11	1.66	8,540	54.95	11,000(?)	11.39

used do not admit of any very definite classification. The coal used in any particular country or locality is determined nearly always by questions of availability and cost. In America the use of anthracite coal is nearly universal for domestic purposes in the East, and it is also used for industrial purposes in many Eastern cities where public sentiment demands the use of a smokeless fuel. The great industrial fuel, however, is coal of the semi-anthracite and bituminous classes, and the coal used in any particular locality is usually the coal which is most available and the cheapest.

The solid fuels other than coal are coke, charcoal, coal briquettes, coal-dust, peat, wood, sawdust, tanbark, straw, and bagasse. *Coke* is the solid material left after evaporating the volatile ingredients of coal, either by means of partial combustion in furnaces called coke-ovens, or by distillation in the retorts of gas-works. It is considerably used as a domestic fuel, and somewhat used for steam-making where some special condition prevails, such as the necessity for a smokeless fuel. For general steam-making, however, its cost and the difficulty of its combustion in ordinary furnaces place coke rather low in the list of fuels available to the steam-user. For metallurgical processes, an important example of which is iron-smelting, coke is almost an invaluable fuel. Coke is composed mostly of fixed carbon and ash, the percentage of volatile matter being seldom over two per cent., and often less than one per cent., of the total. Its heating value ranges generally between 14,400 and 14,600 B. T. U. See COKE.

Charcoal is the carbonaceous residue of wood which has been subjected to a process of smothered combustion. Its principal use as a fuel is in smelting certain kinds of iron. A small amount is used for domestic heating and cooking, and for heating purposes in certain trades and arts. Pure charcoal is nearly pure carbon, but commercial charcoal contains considerable volatile matter which is a decided advantage to it as a fuel. In fact, it has been shown that half-burned charcoal is superior as a fuel to that more completely burned. The heat value of ordinary commercial charcoal is between 7000 and 7200 calories.

Briquettes, or patent fuel as they are sometimes called, are composed of coal or coke dust mixed with a binder of pitch, tar, or other substance, and pressed or molded into blocks, bricks, ovoids, or other forms. Briquettes are not made to any extent in the United States, but in Great Britain and Continental Europe their manufacture constitutes an important industry. They are used like coal for steam-making, and industrial and domestic purposes generally.

Coal-dust, as the name implies, is coal ground to a fine dust or powder. Theoretically coal-dust should be a most excellent fuel, but it has the practical objection of requiring a rather costly apparatus for grinding the coal and feeding it to the furnace, and of requiring great care in its combustion. The manner in which coal-dust is burned is to inject it into the furnace through nozzles or burners by means of air-pressure. The furnace used differs from the ordinary coal-burning furnace in being closed and without grates; both the fuel and the air for its combustion enter the furnace through the nozzle or burner. Powdered coal was used as a fuel in England as early as 1873, but without much success, and the same lack of success has distinguished most of the subsequent attempts to employ it in steam-making. Quite recently, however, coal-dust has been used in firing cement-kilns of the rotary type with so much success that it is now the standard fuel for the rotary kiln process of cement manufacture. The heat of combustion of coal-dust is of course the same as that of the coal from which it is ground; its economy as a fuel comes from the fact that in the finely powdered state of dust the coal burns rapidly and thoroughly without the waste of unburned particles and the formation of clinker; that the combustion is smokeless; and that the cost of firing, furnace repairs, and handling of waste is reduced.

Peat is the agglomeration of partly decomposed vegetable matter obtained from peat-bogs, cut into blocks, and dried to serve as a fuel. Its composition varies but little from that of wood, the composition of Irish peat, for example, being carbon 59 per cent., hydrogen 6 per cent., oxygen 30 per cent., nitrogen 1 per cent., and ash 4 per cent. Air-dried peat contains from 10 to 25 per cent. of water. The heat of combustion of peat is lower than that of brown coal or lignite; for dry Irish peat it is about 10,250 B. T. U., and for moist Irish peat it is about 7390 B. T. U. Generally speaking, a pound of peat will evaporate about five pounds of water from and at 212° F. Peat does not rank as a commercial fuel in the United States; but in Ireland, and some of the western countries of Continental Europe, it is so extensively used that the peat industry is one of importance.

Wood is perhaps the most widely known and used of all fuels. Wood when newly felled contains from 30 to 50 per cent. of water, which after from eight to twelve months' drying in air is reduced to from 20 to 25 per cent. When used as a fuel wood should be as dry as possible, as otherwise some of the heat generated by its combustion is wasted in vaporizing the contained moisture. The following table shows the composition and heating value of the more common woods:

KIND	Carbon	Hydrogen	Oxygen	Nitrogen	Ash	B. T. U.
Ash	49.18	6.27	43.91	0.07	0.57	8,480
Beech	49.06	6.11	44.17	0.09	0.57	8,591
Birch	48.88	6.06	44.67	0.10	0.29	8,586
Elm	48.89	6.20	44.25	0.06	0.50	8,510
Fir	50.36	5.92	43.39	0.05	0.28	9,063
Oak	50.16	6.02	43.36	0.09	0.37	8,316
Pine	50.31	6.20	43.08	0.04	0.37	9,153

It will be noted that the coniferous woods have the higher heating values, due to the contained hydrocarbons in the form of pitch and turpentine. Pine knot containing much pitch has given as high as 10,863 B. T. U. by test. Wood was formerly much used for steam-raising, and is now used for this purpose in newly settled countries and where coal cannot be obtained cheaply. The countries using wood for making steam are, however, growing fewer each year, owing to the discovery of new coal deposits, and the development of transportation systems by which coal can be cheaply imported. Evaporative tests made by Brix in Europe gave the following results in pounds of water evaporated per pound of fuel: Pine, 5.5 pounds; elm, 4.6 pounds; birch, 4.5 pounds; oak, 4.56 pounds; ash, 4.63 pounds; and beech, 4.47 pounds.

Sawdust is often used as a fuel in steam sawmills. The conditions necessary for burning sawdust are that plenty of room be given it in the furnace, and sufficient air supplied on the surface of the mass. It is sometimes burned by blowing it into the furnace by air pressure, much as coal-dust is burned. The heating power of dry sawdust is naturally the same per pound as that of the wood from which it is derived. Generally speaking, sawdust cannot be profitably burned except in furnaces especially designed for its combustion, and where it costs nothing. Sawdust briquettes have been made and utilized as fuel, but only to a very limited extent. *Tanbark* or more correctly the residue of tanbark which has been used in the process of tanning, is sometimes used as a fuel where it can be had at slight cost. The heating value of perfectly dry tan containing 15 per cent. of ash is 6100 B. T. U., according to Peclet. The same authority states that tan in the ordinary state of dryness, containing 30 per cent. of water, has a heating value of only 4284 B. T. U. The weight of water evaporated from and at 212° F. by one pound of tan, equivalent to these heating powers, is, for perfectly dry tan, 5.146 pounds, and for tan with 30 per cent. moisture, 3.84 pounds. *Straw*, like sawdust and tanbark, is used as fuel under special conditions. Experiments have shown dry winter-wheat straw to have a heating value of 6290 B. T. U., and the same straw with 10 per cent. water a value of 5448 B. T. U. *Bagasse* is the refuse of sugar-cane after the juice has been extracted. It is much used as a fuel under the boilers of sugar-mills. Its heating value is from 2000 to 3000 B. T. U., depending upon the quality.

LIQUID FUELS. The only liquid fuels of practical importance are the mineral oils. Animal and vegetable oils may be used for fuel, but, on account of their cost and the demand for them for other uses, they are not used in the arts for heating except on very exceptional occasions. A consideration of liquid fuels is, therefore, confined entirely to a consideration of mineral oil, petroleum and its distillates and residues. Crude petroleum is a hydrocarbon often containing a small percentage of sulphur and oxygen as impurities. It may be broken up by distillation into gasoline, benzine, kerosenes, and other less familiar distillates and residuum of various qualities, any one of which makes a very good fuel under certain conditions. *Gasoline* and its associated distillates are too valuable for other purposes ever to be used as fuel. *Benzine* will also have a restricted use as fuel owing to the difficulty, danger, and expense of transporting it, and to the care with which it must be handled. Were it not for these objections, benzine would be the best of all oil fuels. *Kerosene* is much more suitable for use as a fuel than benzine, because of its portability and the safety and ease with which it can be handled. Roughly speaking, American crude petroleum contains from 50 to 75 per cent. of benzine, and kerosene and Russian crude petroleum contain from 15 to 50 per cent. Peruvian oil is about the same composition as Russian.

The use of kerosene as a fuel is common, but this use is limited by the price of that oil, and its value as an illuminant, to small installations for special purposes. For general industrial purposes, therefore, resort must be had either to the crude petroleum or to the residuum remaining after the kerosene has been distilled off the crude petroleum. In the United States, where the percentage of residuum is so small that its distillation is demanded for lubricating oil, crude petroleum is the only available industrial fuel oil. In Russia, however, the percentage of residuum is so great that only a small portion is required for distillation into machine oil, and the remainder is available for fuel. The residuum is the fuel oil *par excellence*, and in Russia it is used in every possible place. Fuel oils are burned usually in the form of spray, the oil being injected into the furnace through nozzle-like burners by air or steam pressure which breaks it up into fine spray. Their advantages are many, but generally speaking their use must be limited. A few figures will demonstrate the reason for this statement. The coal consumption of the world is probably in the neighborhood of 600,000,000 tons, while that of petroleum is but 17,000,000 tons, of which the greater portion is used for illuminants and lubricating purposes. The amount of petroleum available for fuel purposes is probably, therefore, not more than one per cent. of the coal used. Obviously it cannot be used very extensively as compared with coal. Again, while oil has greater heating value and evaporative efficiency than the best coal, there is always some point where this is counterbalanced by the lesser cost of coal. For example, comparative tests between Lima (Ohio) oil weighing 7.66 pounds per gallon and costing 2½ cents per gallon, and coal giving an evaporation of 7½ pounds of water per pound of coal showed that the two fuels were equally economical when the price of coal was $3.85 per ton. It must appear from this comparison that the use of oil fuel is limited to countries where coal is high-priced, or to uses where its extra cost is not so important as other considerations, such as lesser bulk, cleanliness, and reduction of labor force. The heating value of fuel oils ranges between about 18,000 and 21,000 B. T. U.

Gaseous Fuels. For many purposes the best fuel is combustible gas. The ideal fuel is natural gas, but this is obtainable over only a limited area of the earth's surface. Next in value are gases secured by distilling highly gaseous coals or by enriching water-gas. The following are some of the gases which may be used for fuel: *Blast-furnace gas* is the gas given off by blast-furnaces for smelting iron ore, and its composition varies with the fuel consumption of the furnace and other conditions. Six analyses made from one blast-furnace by Prof. D. S. Jacobus gave the following average figures: Carbon dioxide, 7.08 per cent.; carbon monoxide, 27.8 per cent; oxygen, 0.1 per cent.; and nitrogen, 65.02 per cent. The heating value calculated from this analysis was 1175 B. T. U. per pound. At present, blast-furnace gas is more interesting for the possibilities which it offers as a fuel than for the extent to which it is actually used. The quantity of gas which a blast-furnace discharges is much greater than can be used for driving blowing-engines and heating the hot-blast stoves, and this surplus represents a vast waste of fuel which might be utilized were there a demand for it. In modern steel plants some of this waste is saved by installing additional boilers to make steam for the rolling-mills and Bessemer-works. *Coke-retort gas* is the gaseous by-product distilled off coal in making coke. It makes an excellent fuel, but is for the most part wasted in coke-making as practiced in the United States. To secure coke-oven gas for fuel or other purposes special forms of ovens known as retort or by-product ovens must be employed. The gas given off by retort coke-ovens varies in heating value at different stages of the process of coking the coal. According to tests made on retort-oven gas from Cape Breton coal, the heating value increased during the first three hours from 690 to 770 B. T. U. per cubic foot, then it decreased for 18 hours to 630 B. T. U., and then more steadily for 12 hours to 340 B. T. U. There is a wide field for the use of coke-retort gases for fuel, but it has been only slightly worked. *Water-gas* is produced where steam is blown into a bed of white-hot coke; it consists of equal volumes of carbon monoxide and hydrogen or by weight of 28 parts of carbon monoxide and 2 parts of hydrogen. The heating value of pure water-gas is by calculation 343 B. T. U. per cubic foot. A score of years or so ago there was much hope that water-gas could be manufactured and sold extensively as a fuel, but none of the plants established then or since have been commercially successful. It has, however, a field of usefulness in small furnaces in manufacturing plants and in gas-engines. Water-gas enriched by hydrocarbon gases from petroleum or gas-coal has had great success as an illuminant, and is also much used for domestic stoves and cooking-ranges, and in certain of the arts where its convenience counterbalances its cost.

Producer gas, or air-gas, is a mixed gas containing carbonic oxide and hydrogen compounds, and is formed by the incomplete combustion of coal in special retorts or producers. There are a number of producer-gas processes, and the principal ones with the heating values of these products per cubic foot are as follows: Mond, 155 B. T. U.; Siemens, 134½ B. T. U.; Dawson, 160 B. T. U.; Lencauchez, 207 B. T. U. *Retort gas*, or coal-gas, is gas made by distilling coal in closed retorts heated by coke burning beneath them. Before the advent of water-gas, illuminating gas was produced by this process. A typical analysis of coal-gas given by Dr. Gideon E. Moore shows a heating value of 642 B. T. U. per cubic foot. *Oil-gas* is gas made by decomposing oil, usually petroleum or its derivatives, by means of heat or steam or by steam and air. Pintsch gas, which is so extensively used for car-lighting, is, for example, made by allowing the oil to fall drop by drop on a highly heated surface, and it has a heating value of about 1320 B. T. U. per cubic foot. Oil-gases resulting from a less perfect process range in heating value in the neighborhood of 870 B. T. U. per cubic foot. *Natural gas* varies in composition and in heating value. The best kinds generally range between 900 and 1100 B. T. U. in value, and the poorest kinds fall as low as 400 B. T. U. Natural gas has been used extensively for domestic purposes, steam-making, glass manufacture, iron-making, brick-making, and for numerous other purposes. Its cheapness has until very recently encouraged wasteful use, with the result that in many places the available supply remaining is very limited.

Economical Utilization of Fuel. The question of the economical use of fuel is one of ever-increasing importance, and is receiving much study by engineers. A high authority, Mr. William Kent, has recently stated the conditions as follows: "A fair estimate of the average cost of coal to the consumer, including transportation charges, is $2.50 per long ton, which would make the total fuel bill of the United States, in 1899, approximately $562,757,560. A very large portion of this amount represents a kind of waste that may easily be prevented by means of well-known modern appliances; another portion is waste that is not preventable in the light of our present knowledge; a third is waste that might be saved by the use of appliances which are too expensive to be economically practicable; and a fourth portion is waste that may be saved under some circumstances, and not under others. Examples of the first kind of waste, i.e. that which is easily preventable, are: (1) The use of furnaces for burning soft coal under steam boilers, which are not well adapted to that kind of coal; (2) the discharge of exhaust steam into the atmosphere when all other parts of it might be utilized for heating purposes. An example of the second kind of waste—i.e. that which is not preventable with our present knowledge—is the heat losses in the condensing of water of condensing engines, and in the jacket water of gas-engines. An example of the third kind of waste—i.e. that which may be saved by the use of expensive appliances—is that part of the heat lost in the chimney gases of steam boilers which might be saved by the use of an economizer. An example of the fourth kind of waste, which is preventable under some conditions and not under others, is that of exhaust steam from engines in a factory or other building, which may be utilized for heating purposes in cold weather, but for which there is no use in warm weather."

To the general reader the phase of the subject which is of most direct practical interest is that referring to waste that may be easily prevented by the use of well-known modern appliances. First among these appliances comes the furnace, which if properly designed will insure practically perfect combustion, and if improperly designed will cause a very serious waste of heat-producing fuel. Smokeless combustion of fuel, an important matter in cities, is simply a question of perfect combustion. The second kind of preventable waste, namely, the discharge of exhaust steam without extracting its useful heat, is less easy to handle. Among the means for saving this exhaust heat are the use of economizers and superheated steam.

A calculation of the possible saving to be accomplished by the use of an economizer has been made by Mr. Kent, as follows:

"Assume a boiler evaporation of 8 pounds of water per pound of coal, and a production of 20 pounds of chimney gas per pound of coal, or 2.5 pounds of gas per pound of water evaporated. If the temperature of the furnace is 2150° F. (a theoretical figure, assuming that there is no direct radiation from the fire to the boiler) and the flue gases are 600° F., the heat wasted in the flue gases will be $600 \div 2150 = 28$ per cent. If by an economizer the temperature of the gases can be reduced to 300° F., half of this waste, or 14 per cent. of the total heating value of the fuel, will be saved. The efficiency of the boiler alone will be 72 per cent. and of the combined boiler and economizer 86 per cent. The gain in economy is $14 \div 72 = 19.3$ per cent. The gain of heat per pound of gas is $300 \times$ specific heat $0.24 = 72$ B.T.U., and per pound of water evaporated $72 \times 2.5 = 180$ B.T.U. Also, suppose the feed-water is supplied to the economizer at 100° F. and the steam pressure is 150-pound gauge, corresponding to a temperature of 358° F., and 1213 B.T.U. per pound above 0° F. The heat furnished to the water by the boiler and economizer will be $1213 - 100 = 1113$ B.T.U., of which 180 B.T.U. is supplied by the economizer and 933 by the boiler. The gain in economy is $180 \div 933 = 19.4$ per cent.—a percentage quite possible in practice, provided that there is sufficient heating surface in the economizer and that the feed-water temperature is 100° F., with the gas as hot as 600° F."

After economizers comes the use of steam superheaters. The economy gained by superheating is stated to be from 15 to 20 per cent. with the most economical forms of engines, when the steam is superheated 100° to 150° F. For many purposes the best method of utilizing coal is to convert it into gas, and burn the gas in the furnace, or to grind it to dust, and burn this dust. When all is said, however, the great desiderata in the economical use of fuel are a well-designed and apparent furnace and a similarly perfect boiler.

The literature on fuel and its economical utilization is extensive and widely scattered, but the following two books will be found to meet all the ordinary requirements for information: William Kent, *Steam Boiler Economy* (New York, 1901); Herman Poole, *The Calorific Power of Fuels* (New York, 1898). The following articles in this Encyclopædia may also be consulted with advantage: Combustion; Coal; Charcoal; Gas; Petroleum; Coke; Furnaces; Boilers.

FUENTEOVEJUNA, fwān'tȧ-ō-vȧ-ʜo͞o'nȧ. A town in the Province of Cordova, Spain, 45 miles northeast of the city of Cordova. It is situated in a well-watered agricultural region. There are deposits of argentiferous lead, calcite, etc., and manufactures of leather, soap, flour, bricks, and tile. The curing of meat is among the industries. In the vicinity are two mineral springs. The parish church occupies the site of the palace of the Knights of Calatrava, to whom the village was granted by Henry III. in 1430. Some authorities maintain that Fuenteovejuna is the ancient *Mellaria* (named from the abundance of honey). Population, in 1900, 10,717.

FUENTERRABIA, or **FONTARABIA**, fwān′târ-rȧ-bē′ȧ. A town in the Province of Guipúzcoa, Spain, about ten miles east-northeast of San Sebastian; on the River Bidassoa, near its estuarial expansion (Map: Spain, D 1). It is built on a hill and retains much of the picturesque interest of a ruined mediæval town, though outside of the walls a modern quarter is developing. It has a castle dating from the tenth century, and a pretentious town hall; in the municipal archives are valuable records. Magdalena, situated in the vicinity, is a popular watering-place. The fisheries constitute an important industry; there is some coastwise trade; and particularly in the new quarter manufactures are flourishing. Population, in 1900, 4422. Owing to its position on the French frontier, Fuenterrabia has been the scene of many conflicts between the French and Spaniards, not the least famous of which was the repulse of the Prince of Condé in 1638. It was fortified toward the close of the twelfth century, and in 1524 its defenses were strengthened; but in 1794 the town was captured by the French, and its works were destroyed. In 1813 the Duke of Wellington succeeded in crossing the Bidassoa near Fuenterrabia in spite of the valiant opposition of the French under Marshal Soult. The town played a part also in the Carlist wars of the nineteenth century. Latin inscriptions found in the vicinity gave basis to the theory that this locality was known to the Romans.

FUENTES, fwān′tȧs, or **FONTE**, fōn′tȧ, Bartolome. A Spanish or Portuguese navigator, who is said to have discovered in 1640 a passage uniting the Atlantic and Pacific oceans north of the American continent. An account of this voyage first appeared in a letter published in the *Monthly Miscellany* (London, in 1708), but doubt has been cast upon its authenticity, and by many Fuentes is believed to have been a fictitious personage. The mystery attaching to the affair has led to considerable discussion among scholars. Vancouver admitted the possibility of the discoveries of Fuentes. The real or fictitious discoveries assigned to this navigator have frequently been referred to in works published in Paris and in London, and notably in the book entitled *The Great Probability of a Northwest Passage, Deduced from Observations on the Letter of Admiral del Fonte.*

FUENTES, Don Pedro Henriquez d'Azevedo, Conde de (c.1535-1610). A Spanish soldier and statesman, born at Zanora. He served in the Netherlands, and under Alva in Portugal, where he commanded the Spanish army in 1589, and defended Lisbon with complete success against the English. From 1591 to 1596 he was civil and military assistant to the royal governors in the Netherlands. About 1600 he was appointed Captain-General and Governor at Milan, where he was incessantly busied with crafty political manœuvres. He has often been confused with another of the name (known to the French as *Fontaines*) who fell at his defeat by the Duc d'Enghien, near Rocroi (May 19, 1643). Consult the life by Duro (Madrid, 1884).

FUENTES DE ONORO, fwān′tȧs dȧ ȯ-nō′rȯ. A village of Spain, on the Portuguese border, 14 miles west of Ciudad Rodrigo. It is celebrated as the scene of a battle between Wellington and the French under Masséna and Bessières, May 3, 1811. The French, by a furious charge, twice drove back the British lines; but each time the latter, at the point of the bayonet, regained the lost ground. When night came on Masséna retreated, with the loss of about a thousand men. The battle, indecisive in itself, served to keep the French out of Portugal and encouraged the English at home.

FUERO, fwȧ′rō (Sp., jurisdiction). A term applied in Spain originally to courts of local jurisdiction, and transferred later to collections of laws, or to charters of civic rights granted by kings to individual cities. The most famous were those of Leon and Najera. As these city charters contained, for the most part, special liberties and privileges, the word *fueros* became current chiefly in this sense, and was particularly so applied to designate the body of privileges and liberties that made up the Constitution of Navarre and of the three Basque provinces of Vizcaya, Alava, and Guipúzcoa. These are the fueros for the maintenance of which the Basques fought in the Carlist wars of the nineteenth century. The fueros of other provinces and cities of Spain have been long extinct. The Basque fueros were grounded on the old laws of the Visigoths, and grew up in the period between the irruption of the Moors into the Spanish Peninsula and the consolidation of the Spanish monarchy under the House of Hapsburg. The same was the case in the semi-Basque Province of Navarre, which formed an independent kingdom under its own sovereigns. The fueros were thus the product of the ancient Gothic laws and the new circumstances under which they were applied. They resulted by degrees, here as elsewhere, in a struggle between the people and the princes; and their development forms an interesting chapter in the history of modern constitutionalism. They were at first only privileges and statutory rights granted to single places, and from these were extended to others. By the introduction of the representative element of the Cortes and the extension of the fueros over whole provinces, they were transformed, in virtue of the general law of custom, into constitutional rights of these provinces, and were in time collected and formally embodied and sanctioned as such. It was in this way that the fueros of Navarre, which had been growing into consistency for centuries, were, in 1236, during the contests between King Theobald and his Cortes, collected and recorded, being still extant under the title of *Cartulario del rey Tibaldo.* Ferdinand the Catholic, who united Navarre with the Crown of Castile, maintained the fueros, adapting them to the new relations existing with Castile. According to the fueros of Navarre, the Cortes, chosen for three years, and consisting of the three estates of clergy, nobles, and commons, met yearly; and without their consent no law could be passed or anything of importance undertaken. The Government consisted of the Viceroy, who presided in the Cortes and Great Council; the Great Council of Navarre, a body similar to the old French Parlements; and the *contadura*, before which all accounts of revenue and expenditure were laid.

There was no custom-house or toll but at the frontier, and except the trifling grant of 176,000 reals, nothing flowed into the royal treasury. All these fueros the King had to bind himself by oath to maintain.

In the Lordship (*señorío*) of Vizcaya, the fueros grew up in the contests of the inhabitants with their counts. They were first collected into a code by Count Juan in 1371; and this, after the final union of Vizcaya with Castile, was recast, completed, and confirmed by King Charles I. (the Emperor Charles V.). According to this charter of rights, every new 'lord'—this being the title given by the Biscayans to the King of Spain as their prince—on attaining the age of fourteen, must come into the country within a year, and in certain places appointed for that purpose take the oath to uphold the fueros. The Government consisted of a *corregidor*, appointed by the 'lord,' and two deputies; and these, aided by six *regidores,* and forming the *regimiento,* conducted the administration. The supreme power resided in the General Assembly (*junta general*), which met yearly under the tree at Guernica, regulated all the affairs of the lordship, and appointed the deputies and regidores. Justice was administered, in the first instance, by the lieutenants (*tenientes*) of the Corregidor; in the second by the Corregidor and his deputies; and in the third, by the Royal Court at Valladolid. Other privileges were, that every Biscayan of pure blood was counted noble; that except the post-office there was to be no royal governing board in the province; that Biscayans were not bound to serve in the Spanish Army. The fueros of Alava and Guipúzcoa were of analogous origin and character, but differed in details. Abolished by Espartero, these fueros were restored by Queen Isabella in 1844. In 1876 a law abolishing the Basque fueros was adopted, and in 1877 a decree was passed assimilating the administration of the Basque Provinces to that of the rest of Spain. Consult: Rivero, *Colección de fueros municipales* (Madrid, 1847); id., *Catáloga de fueros y cartas-pueblas de España* (Madrid, 1852); Marichalar y Manrique, *Historia de la legislación civil en España* (Madrid, 1868). See Basque Race; Spain.

FUERO, Joaquin (1814-67). A Mexican soldier. He was born at Guadalupe Hidalgo, and was educated at the Military College of Segovia, at which he subsequently became professor and vice-president. After suppressing the insurrection of 1840 he was, in 1843, appointed chief of staff of the army division in Tamaulipas, and also fought with distinction in the war with the United States, and received a wound from which he ultimately died. Besides a Spanish translation of General Makenna's *Treatise on Military Tactics,* he published a *Manual del militar, ó tratado completo de instrucción en la ordenanza* (1842).

FUERTES, fwâr'tâs, Estevan Antonio (1838 —). An American civil engineer and educator, born at San Juan, Porto Rico. He graduated at the Troy (N. Y.) Polytechnic Institute in 1857, became a member of the royal corps of engineers in Puerto Rico, and in 1862-63 was director of public works for the western district of the island. In 1863 and 1864 he was assistant engineer, from 1864 to 1869 engineer on the Croton Aqueduct Board, and in the latter capacity prepared a valuable report on the connection of the Croton water-supply with the manufactures of New York City. In 1870-71 he was the engineer-in-chief of the United States expedition to Tehuantepec and Nicaragua, to investigate the practicability of a trans-isthmian ship-canal. He became dean of the department of civil engineering in Cornell University in 1873, and from 1890 to 1902 was director of the college of civil engineering, and obtained for Cornell an excellent special equipment for this work. He has been a member of the American Society of Civil Engineers and other learned organizations, and published numerous scientific articles and reports.

FUERTEVENTURA fwâr'tȧ-vĕn-to͞o'rȧ. One of the Canary Islands (q.v.), situated south of Lanzarote, across the Straits of Bacayna (Map: Spain, B 5). Its area is over 650 square miles. There are a number of extinct volcanoes, with a maximum elevation reaching 2800 feet. The soil is only slightly productive, the larger portion being best adapted for grazing. Tree-growth is almost entirely lacking except in the case of a few fruit and nut trees. Population, in 1900, 11,662. Cabras, on the east coast, has a good barbor.

FÜESSLI, fụs'lė, or **FÜSSLI.** A Swiss family, originally from Zurich, several members of which were artists. Matthias, called The Old (1598-1665), the first engraver-painter of the family, studied in Italy, and produced some excellent battle-pictures and portraits. A descendant, Johann Kaspar (1707-82), also an artist, painted portraits, but is celebrated for his work on Swiss artists, *Geschichte und Abbildungen der besten Künstler in der Schweiz* (1769-79). Another descendant was Johann Heinrich (1742-1825), born at Zurich, and called in England Henry Fuesli. He studied in Berlin, London, and Italy, and finally made his home in London. In 1786 he painted a series of pictures illustrating Shakespeare, and these were followed in 1799 by forty-nine paintings for *Paradise Lost.* His powerful imagination makes these curious works, often purely metaphysical, very interesting; but he was not a colorist, and he never considered the factor of beauty. He became professor at the Royal Academy, and gave some lectures on art which were in many ways remarkable. He wrote a dictionary of painters, some notes on Swiss art, and a study of Michelangelo. An edition of most of his works was published in Zurich (1808).

FUGA, fo͞o'gȧ, Ferdinando (1699-1784). A prominent Italian architect of the Barocco period, born in Florence in 1699. He worked principally at Rome, where his masterpiece is the Corsini Palace. He then went to Southern Italy, and died while engaged in reconstructing the Cathedral of Palermo.

FUGARA, fo͞o-gä'rȧ (It., from *fugare,* to flee). The name of a well-known organ stop of four or eight feet pitch, with metal flue-pipes generally of a small scale. The tone has a sharp, 'stringy' quality.

FUGATO, fo͞o-gä'tô (It., p.p. of *fugare,* to put to flight). A passage consisting of fugal imitations. Only the entrances of the several voices are given. After the first development is completed the composition continues in the free style. See Fugue.

FÜGER, fṳ′gẽr, Heinrich (1751-1818). A German painter, born at Heilbronn, Württemberg. He was a pupil of Guibal in Stuttgart, and of Oeser in Leipzig. Afterwards he traveled, and spent some time in Rome. In 1806 he became director of the Belvedere Gallery, Vienna. Among his historical paintings are: "The Death of Germanicus" (1789); "The Murder of Cæsar;" "The Farewell of Coriolanus;" "Allegory on the Peace of Vienna" (1801); "Achilles at the Body of Patroclus;" "Apollo and the Muses;" and among his portraits those of the Emperor Joseph II., the Grand Duchess Elizabeth, and Queen Caroline of Naples. He painted in the classic style of the school of David.

FUGGER, fṳg′gẽr. A German family of Augsburg, important in Continental financial history. The founder of the family was Johann Fugger, master-weaver in Graben, near Augsburg, about the middle of the fourteenth century, who married Marie Meissner of Kirchheim. His eldest son, Johann, acquired by marriage in 1370 the freedom of Augsburg, and began to carry on a trade in linen together with weaving. By a second marriage in 1382, with the daughter of a councilor, he had two sons and four daughters. This Johann Fugger was one of the council of twelve (*Die Zwölfer*), in the weaving guild, and an assessor of the famous Vehmgericht or secret tribunal of Westphalia. He died in 1409, and left a considerable fortune. His eldest son, Andreas, made such good use of his share of the inheritance that he was known as 'the rich Fugger.' He founded a noble line, which died out in 1586. Johann's second son, Jakob, who died in 1469, was the first of the Fuggers who had a house in Augsburg, and carried on an extensive commerce. Of his seven sons, three, Ulrich, Georg, and Jakob II., by industry, ability, and integrity, laid the foundation of the princely prosperity of the family. Its members married into the noblest houses, and were raised by the Emperor Maximilian to the rank of nobles. The Emperor mortgaged to them, for 70,000 gulden, the county of Kirchberg and the lordship of Weissenhorn, and received from them afterwards, through the mediation of Pope Julius II., 170,000 ducats, to assist him in carrying on the war against Venice. Ulrich (1441-1510) devoted himself specially to commerce with Austria, and there was hardly an object that did not enter into his speculations. Jakob (1459-1525) engaged in mining; he farmed the mines in Tyrol, and accumulated immense wealth; he lent to the Archduke of Austria 150,000 gulden, and built the magnificent castle of Fuggerau, in Carinthia. Under Charles V. the house attained its greatest splendor. Jakob having died childless, and the family of Ulrich being also extinct, the fortune of the house rested with the sons of Georg (died 1506), one of whom, Markus, entered the Church. The two younger, Raimund and Antonius, carried on the business, and became the founders of the two chief and still flourishing lines of the House of Fugger. The two brothers were zealous Catholics, and with their wealth supported Eck in his opposition to Luther. During the Diet held by Charles V. at Augsburg, in 1530, the Emperor lived in Antonius Fugger's splendid house on the Weinmarkt. On this occasion he raised both brothers to the rank of counts, and invested them with the still mortgaged properties of Kirchberg and Weissenhorn; and a letter under the Imperial seal conferred on them the rights of princes. In 1535 they received the right of coining money. Antonius, at his death (1560), left 6,000,000 gold crowns in ready money, besides jewels and possessions in all parts of Europe and in both Indies. Ferdinand II. confirmed the Imperial letter of Charles V., and conferred additional privileges on the family. The Fuggers continued to carry on commerce, attained the highest posts in the Empire, and several princely houses prided themselves on their alliance with the House of Fugger. They possessed the most extensive libraries and collections of art, maintained painters and musicians, and liberally encouraged art and science. Ulrich, Georg, and Jakob, the sons of the first Jakob, bought houses in one of the suburbs of Augsburg, pulled them down, and built 108 smaller houses, which they let to poor citizens at a low rent. This was the origin of the 'Fuggerei,' which still remains under the same name, with its own walls and gates. Many other benevolent institutions were set on foot by Antonius and his sons. The race is continued in the two principal lines of Raimund and Antonius, besides collateral branches. The domains are chiefly in Bavaria. A collection of portraits of the most important members of this great house, executed by Dominicus Custos, of Antwerp, appeared at Augsburg (1593, et seq.). This collection, increased to 127, with genealogies written in Latin, was republished by the brothers Kilian (Augsburg, 1618), and in 1754 a new edition of the work, still further improved, and containing 139 portraits, was published at Ulm, under the title *Pinacotheca Fuggerorum.* Consult Stauber, *Das Haus Fugger von seinen Anfängen bis zur Gegenwart* (Augsburg, 1900).

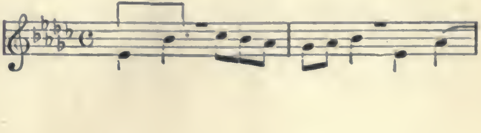
FUGITIVE SLAVE LAW. In the history of the United States, the name of two statutes enacted for the purpose of securing to the slaveowners their rights in slaves who had escaped from the State in which they were held in servitude. Such statutes were directed to the enforcement of Article IV., section 2 of the Constitution, which provides that "persons held to service or labor in one State, under the laws thereof," escaping into another, "shall be delivered up on claim of the party to whom such service or labor may be due." The existence of slavery depended entirely upon the sanction of State laws, and could in no way be affected by Federal laws. If, however, slavery was merely a status dependent upon positive enactment, such status ceased when the slave entered a State where slavery was prohibited. On the other hand, if the master's right in the slave was a property right, the situation was quite different. Property rights were defined by State laws, and the protection of such property rights in all other States was guaranteed by the Federal Constitution. Upon the 'property' theory of slavery, it was thus possible to pass such an enactment as that of February 12, 1793. This gave the owner or supposed owner of a fugitive slave the right to seize the alleged fugitive, to take him before any Federal judge or certain local magistrates, and, upon satisfying the judge or magistrates of his ownership, to secure a warrant for removing the slave, or alleged slave, to the State of the owner's domicile. There was no provision for a jury in this preliminary trial; the warrant might be secured upon the testimony of the owner alone, and a heavy fine was imposed for obstructing the owner or rescuing or concealing the alleged fugitive. The rigor of the act gave opportunity for considerable laxity in its enforcement, and as soon as the controversy over slavery became acute, efforts were made to amend the act or to nullify its effect. A way toward the latter end seemed to be opened by the decision of the Supreme Court in the case of Prigg against Pennsylvania (q.v.), in which it was held that the duty of enforcing the statute rested solely upon the Federal authorities. Thereupon various States passed laws prohibiting State officials from assisting in the enforcement of this Federal statute, and forbidding the use of State jails for such a purpose.

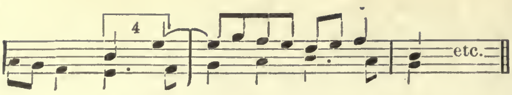
The continued and vigorous demands of the South for a more complete recognition of its rights led to the inclusion in the Compromise Measures of 1850 (q.v.) of a new Fugitive Slave Law, the statute of September 18, 1850. This included many features of the old act, and in addition provided for certain commissioners, with jurisdiction concurrent with that of the courts, who received a larger fee in case they decided in favor of the claimant than if they decided in favor of the fugitive. *Ex parte* testimony was sufficient to determine even the identity of the fugitive; the testimony of the alleged slave was expressly barred, and he was denied a jury trial, even after being returned to the State whence he had fled. The enforcement of the law was placed wholly in the hands of Federal officials, and heavier penalties were imposed upon violators of the law. The extreme anti-slavery element in the Northern States soon forced the issue by refusing to recognize the 'finality' of the Compromise of 1850, and by securing the passage of the so-called 'personal liberty' laws. These prescribed heavy penalties for the seizure of free persons, forbade State officials to aid in enforcing the Federal act, and provided that the fugitive should be entitled to a writ of *habeas corpus*, and to a trial by jury. Other requirements of the State laws served to minimize the effect of the Federal statute, and in some cases almost to nullify it. Ten States passed such laws, and thus afforded the South an available ground of complaint. The second Fugitive Slave Law was finally repealed on June 28, 1864. Consult McDougall, *Fugitive Slaves* (Boston, 1891). See SLAVERY; UNDERGROUND RAILWAY.

FUGLEMAN, fū'g'l-măn (from Ger. *Flügelmann*, file-leader, from *Flügel*, wing, file + *Mann*, man). A term more common in Europe than in the United States and used to denote a soldier posted a little in advance of the body of troops of which he is a part, to give the time to his fellows, in the execution of an order entailing more than one distinct movement. Fixing and unfixing bayonets and drawing or returning swords are instances in point. He is usually a flank man, hence the name.

FUGUE, fūg (Fr., from It. *fuga*, fugue, flight, from Lat. *fuga*, flight, from *fugere*, Gk. φεύγειν, *pheugein*, to flee, Skt. *bhuj*, AS. *būgan*, to bend). In music, the name of a composition wherein the parts do not all begin at once, but follow or pursue one another at certain distances; hence the name *fuga*, a flight or chase, each part successively taking up the subject or melody. Any voice may begin the fugue, but the others follow according to fixed rules. The *subject* is generally a few bars of melody, which is given out in the principal key by the voice which begins. The subject of a fugue should always be short—three or four bars—so that it impresses itself upon the memory, and can be followed and distinguished in the course of the composition. Also, it must *never* be constructed periodically. (See FORM.) After the subject (*dux*) has been announced, the second voice repeats it a fifth above or a fourth below. It is then called the *answer* (*comes*). The first voice meanwhile proceeds with a counterpoint, as does every successive voice upon the completion of the fugue theme. This counterpoint is constructed so as to afford the composer opportunities for ingenious contrapuntal combinations in the further development of the fugue. The third voice follows with the subject again in the principal key, but an octave higher or lower than the first voice, and is answered by the fourth voice in the same manner as the second voice answers the first. When the subject and answer have been introduced in all the parts, the first section or first *development* of the fugue is said to be completed; an episode of a few bars then follows, sometimes in its form like part of the subject, and with a modulation into a nearly related key. The subject and answer are again brought forward, but following in a different order from the first section; while at the same time all the parts are continued, and in some of them the original counterpoint appears either simply or inverted, the subject and answer forming the predominating idea throughout the whole composition.

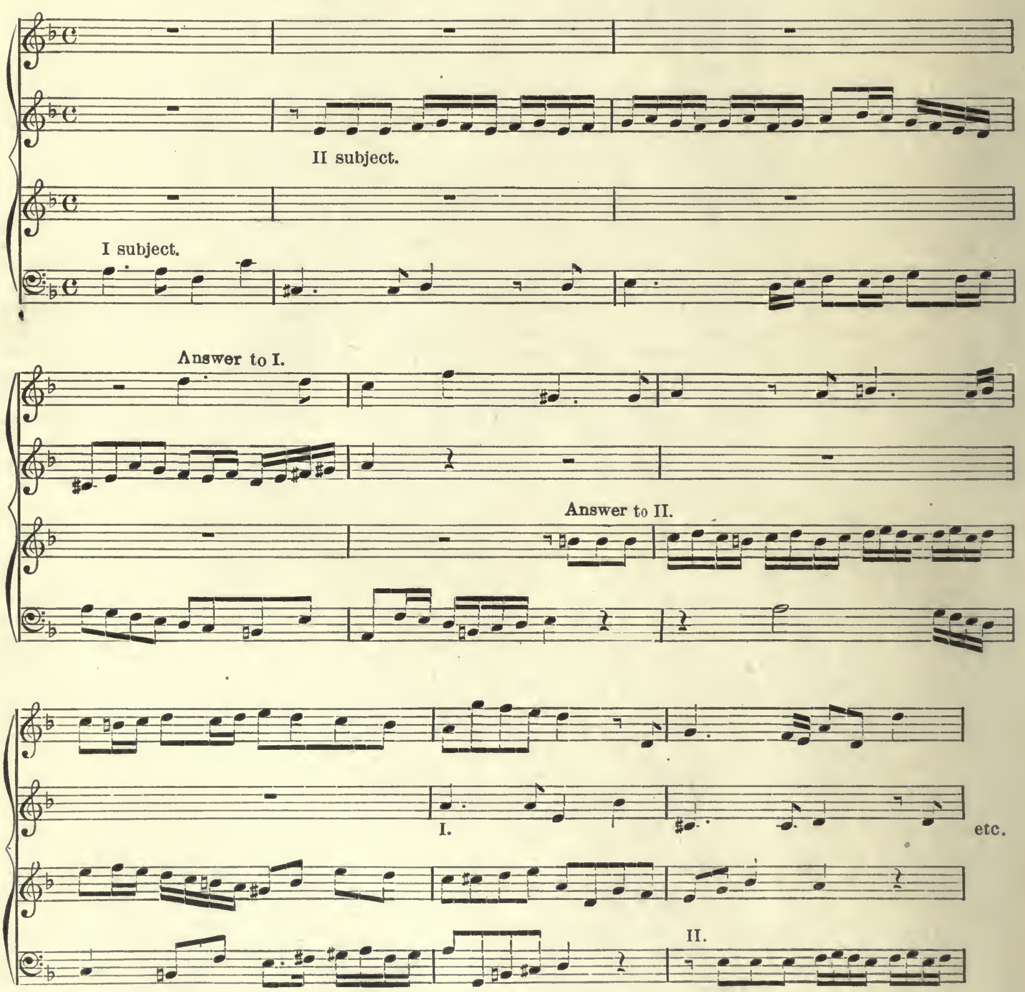
This is the second development, and is again followed by an episode. The greater the number of voices that are employed in a fugue, the greater will be the number of development sections. A four-part fugue admits of no less than 24 possible development sections; while in a five-part fugue the composer may use any number of developments out of a possible 120. In extended fugues the composer must exercise all his ingenuity on the episodes, otherwise the frequent repetitions of the development section will tire the hearer. Beginning with the third or fourth development, the answer is often given in another interval than the fifth, so as to avoid monotony. Even transposition into other keys is permissible. Masters of the fugue sometimes give the answer in *inversion*, *augmentation*, or *diminution*. (See the separate articles.) The last development is generally an exhibition of all the composer's contrapuntal art. Bach generally closes with a *stretta* (q.v.), where the subject and answer are crowded together, so that the latter begins before the former is completed. Often the stretta is elaborated over an organ-point (q.v.). When the subject does not extend in compass beyond the half of an octave, the answer is invariably made in the other half, and to avoid modulation out of the key, the progression of a fifth is answered by a fourth. A fugue consisting of one subject with a counterpoint throughout is called a *strict fugue*.





When a second subject is introduced in the middle of the composition and afterwards worked up with the first subject, it is then called a *fugue on two subjects.*

A *double fugue* begins at once with two subjects in different parts, both of which are strictly treated throughout.



There are also fugues with three subjects (*triple fugue*) ; a famous example is that in the finale of Mozart's C Major (Jupiter) Symphony. A *free fugue* is that in which the subject and counterpoint are not strictly treated throughout, but mixed up with episodes and ideas not connected with the subject. The fugue is not, as has been erroneously believed, a production of German genius. This form was gradually developed from the canonic tricks of the Dutch masters by the great Italian masters of the sixteenth and seventeenth centuries — Merulo, Frescobaldi, Pasquini. It reached its highest development in the eighteenth century, in the works of Bach (instrumental) and Handel (vocal). Bach's fugues have never been equaled, and are, in fact, musical problems of great depth. He devoted a special work to the subject, *Die Kunst der Fuge* (1749). His *Inventionen* and *wohltemperirte Klavier* (1722) are necessary to every pianist, and his *Musikalisches Opfer,* elaborated on a theme given to him by Frederick the Great in 1747, are among his best examples. Handel ranks next to Bach. Celebrated treatises on fugues are by Mattheson, Marpurg, Fux, Albrechtsberger, André, Marx, Lobe, Jadassohn, Cherubini, and Fétis.

FUH-CHOW, fōō′chou′. See FU-CHOW.

FUH-HI, or **FO-HI**, fōō′hē′. A legendary or semi-mythical chieftain of China, the first of the Wu-ti or 'Five Rulers,' who emerge in succession from the haze of the purely mythical period of Chinese history, and who were succeeded about B.C. 2356 by Yao, with whose reign the Chinese historical classic known as the *Shu King* opens.

The first year of his reign is usually placed in B.C. 2852, though some make it earlier.

Fuh-hi is the reputed founder of the Chinese nation, and is said to have laid the foundations of civilization among a people who were still little better than beasts, eating raw flesh, clothed with the skins of wild animals, pairing promiscuously, and destitute of even the rudest arts of life. He taught them the arts of fishing, hunting, and pasturage, and instituted marriage, dividing the people into 100 families or clans, to which he gave a name, and ordaining that persons of the same clan should not intermarry, a custom observed in China to the present day.

His own surname was *Fêng*, 'wind,' and his birth was miraculous, having been carried in his mother's womb for twelve years. Among many other things, he is reputed to have discovered the elements of writing on the back of a tortoise or dragon, which rose from the waters of the Yellow River. From thence he evolved the *Pah-Kwa* (q.v.), or 'eight trigrams,' which by combination and multiplication form the sixty-four hexagrams, on which is based the text of the *Yih-King*, the oldest book in China, and one of the five *King*, or classics. He died in B.C. 2738, and was succeeded by *Shing-Nung*, the 'Divine Husbandman,' who introduced agriculture, and continued the task of civilizing and uplifting his people. Consult: Mayer, *Chinese Reader's Manual* (Shanghai, 1875); La Couperie, *Western Origin of the Early Chinese Civilization* (London, 1894); and Legge, "The Yih-King," in *Sacred Books of the East*, vol. xvi. (Oxford, 1882).

FÜHRICH, fụ'rĭk, JOSEPH VON (1800-76). An Austrian historical painter and engraver. He was born at Kratzau, Bohemia, February 9, 1800, and studied under Bergler at the Prague Academy, where he became greatly influenced by the literary works of Schlegel and Tieck, designing fifteen plates for the latter's *Genoveva* before going to Rome. In that city he joined the German Pre-Raphaelites, and while there collaborated with Overbeck, Veit, and Koch, in painting the frescoes in the Villa Massimi. They represented illustrations of Dante's *Divine Comedy*, Ariosto's *Orlando Furioso*, and Tasso's *Jerusalem Delivered*, and reveal in their execution the first note of modern German art. Born and bred a country boy, Führich felt the beauty and influence of landscape as a background to biblical subjects, and the study of Dürer made him lean toward the portrayal of patriarchal scenes. His painting of "Ruth and Boaz" is idyllic in its representation, and his "Jacob and Rachel" is similarly treated. In 1841 he was appointed professor at the Academy in Vienna, but continued many of his important works. For his fresco painted in the Church of Altercheníeld, a work which occupied the years between 1854 and 1861, he was knighted and received the decoration of the Order of the Iron Crown. Among his works are "Joshua Before Jericho," the "Mourning Jews," "Christ on His Way to the Mount of Olives," "Peter's Draught of Fish," the "Prodigal Son," and "Mary's Journey Over the Mountain," in the Gallery of Vienna, his best work. At the age of seventy-one he illustrated the legend of Saint Gwendolen. Führich died at Vienna. Consult: His autobiography (Vienna, 1875); and the monograph by his son Lucas (ib., 1886); also Muther, *History of Modern Painting* (London, 1895).

FUJI-SAN, fo͞o'jē-sän'. See FUJIYAMA.

FUJIWARA, fo͞o'jē-wä'rȧ. The name of one of the most renowned noble families in Japan, eminent in civil affairs, as the Taira and Minamoto were in military, and the Tatchibana were in religious affairs. The founder was Kamatari, Regent of the Empire A.D. 645-49, reputed to be the twenty-first in descent from his heavenly ancestor who served the great-grandfather of the first Mikado. The family was most powerful at Court from the eighth to the twelfth century, and down to the present time has been notably productive of statesmen, artists, poets, authors, scholars, historians, etc. (Consult Metchnikoff, *Empire du Japon*, vol. i., Geneva, 1881, for a list of these.) The Princess Sada, wife of the Crown Prince of Japan, is of the Fujiwara family, of the fortieth generation in descent from Kamatari, the founder, the eighteenth from Tadamitsu, the founder of the Kujo family.

FUJIYAMA, fo͞o'jē-yä'mȧ (more correctly FUJI-NO-YAMA, or FUJI-SAN; frequently but incorrectly called FUSIYAMA). The highest mountain of Japan, situated in the Province of Suruga, 60 miles west of Tokio, and visible from fourteen provinces, as well as far out at sea; height, 12,365 feet. It is a volcano, with a crater 500 feet deep, and about 2½ miles in circuit. Tradition says that it rose from the plain in a single night, B.C. 285, while at the same moment Lake Biwa (q.v.), near Kioto, was formed. The last recorded eruption began November 24, 1707, and lasted until January 22d of the following year. A hump called Hō-yei-zan (9400 feet), noticeable on its south side, was then produced. As the sacred mountain of Japan, it is annually frequented by many thousands of pilgrims from all parts of the empire. Its summit may be reached by five different paths. Shrines and temples are numerous. Fuji-san is the focus of Japanese legend, the frequent theme of the poet, and a familiar object in Japanese art.

Consult: Chamberlain, *Things Japanese* (London, 1892); Griffis, *The Mikado's Empire* (New York, 1900); Satow and Hawes, *Handbook for Travelers in Central and Northern Japan* (Yokohama, 1881); and the ordinary books of travel.

FU-KIEN, fo͞o'kē-en, or **FO-KIEN**, fō'kē-ĕn'; in the local dialect HOK-KIEN. A maritime province of China, bounded on the north by Che-kiang, on the northwest and west by Kiang-si, on the south by Kwang-tung, and on the east by the Formosa Channel; area, 38,400 square miles; population, about 25,000,000; capital, Fu-chow (q.v.). In 1886 Formosa (now belonging to Japan) was detached from it and made a separate province. The general surface is hilly, in some places quite mountainous, especially along its western boundary. The only comparatively level alluvial tracts are found near the mouths of the great rivers, the Min and the Lung, and their numerous tributaries. The soil is fertile and in a high state of cultivation, producing tea, rice, wheat, barley, sweet potatoes, indigo, and sugar. Quantities of timber are obtained from the mountainous districts of the interior, and floated down the Min to Fu-chow, where it is transhipped to Shanghai and other ports. The manufactures are few.

Tea is extensively grown and exported, and it is a noteworthy fact that the first tea imported into England in 1666 (known as Bohea) came from the Wu-yi (pronounced *boo-he*) in this province.

The Province of Fu-kien has long been noted for its production of porcelain. That produced in the Sung Dynasty (960-1280) was originally made at Chien-an Hien, and is described by an author of the eleventh century as being "invested with a soft black glaze flecked with lighter spots, like the fur of a hare." Fu-kien porcelain of the present day is white instead of black, and is produced at the potteries of Teh-hwa Hien, established in the early part of the Ming Dynasty (1368-1644).

Fu-kien was the great centre of the early trade with the Arabs and Sumatra, and is noted historically for its close relations with the Japanese, and its stubborn resistance to Manchu rule. In our day it is noted for its reformers and 'progressives.'

Its two treaty ports are Fu-chow and Amoy (q.v.). In 1899 another port, San Tu Ao (Samsah Inlet), further north, was voluntarily opened to foreign trade by the Chinese authorities.

FUKUI, fo͞o-ko͞o′ē. The name of seven or more places in Japan, but especially of the chief city of the Province of Echizen, and the ken or prefecture of the same name. Population of the ken, in 1898, 632,580; of the city, 44,290. Fukui is situated on both sides of the Ashiwa River, five miles from the sea. The chief manufacture is habutai, a thin white silk, the production of which in recent years has reached a value of over $10,000,000. The city is clean and cheerful, and has had a famous history. In the modern renascence of the nation, Fukui was one of the first educational centres, and is at once the stronghold of Buddhism and the seat of thriving Christian missions. Its palmy days were under its feudal lord, Matsudaira, whose ancestry held the white-walled and ivy-clad castle for over 300 years, and whose farewell to his thousands of retainers, October 1, 1871, was one of the striking episodes of feudalism. Consult Griffis, *The Mikado's Empire*, chs. vii., viii., ix., xv. (New York, 1900).

FUKUOKA, fo͞o′ko͞o-ō′kȧ. A prefectural town of Japan, situated on the northern coast of Kiusiu, about 50 miles from Kokura (Map: Japan, B 7). It has a number of fine streets, an old castle now occupied by a garrison, and a public garden. Population, in 1898, 66,190.

FUKUSHIMA, fo͞o′ko͞o-shē′mȧ. A prefectural town of Japan, situated in the Province of Iwashira, 49 miles by rail from Sendai, and 168 miles from Tokio (Map: Japan, G 5). It lies in a very picturesque region, and is an important centre for trade in raw silk and silkworms' eggs. Population, in 1898, 20,624.

FUKUYAMA, fo͞o′ko͞o-yä′mȧ. A seaport of Japan, situated at the southern end of the island of Yezo, over 60 miles from Hakodate (Map: Japan, C 6). It was formerly the seat of the lords of Matsumai, and was the chief outlet for the trade of Yezo. Since the abolition of feudalism the town has lost its commercial importance and has been superseded by Hakodate. It contains a number of interesting temples and has an estimated population of 15,000.

FUKUZAWA, fo͞o′ko͞o-zä′wȧ, YUKICHI (1834-1901). A Japanese author and journalist, born in the Province of Buzen. Going to Yedo (Tokio) in 1858, he was so fortunate as to be invited to accompany Katsu Awa in the first Japanese steamer that crossed the Pacific, remaining several months in the United States, studying its institutions and ways of thought. In 1862 he accompanied the Japanese embassy to Europe sent to obtain concessions with a view to limiting and checking foreign trade with Japan, and to postponing the opening of the seaports mentioned in the treaties with the powers, until January 1, 1868. He improved his opportunity while in London to purchase a library of foreign books and to improve his knowledge of English. In 1866 he published a work, the first of its kind, in several volumes, called *Sei Yō Jijō* (Western Manners and Customs), which became instantly popular. It was read by immense numbers, and probably did more than any other publication or event to turn the minds of the Japanese people toward the adoption of Western civilization. He again visited the United States, and on his return was appointed an instructor in the Government College in Yedo, where he continued until the civil war in 1868. He then entered upon that systematic course of literary labor by which, through his books and his newspaper, the *Jiji Shimpo*, he has influenced the reconstruction of Japanese literary style. He wrote on an amazing variety of subjects, criticising old Japanese traditions, opinions, and customs, and opened lecture halls and helped to form the scholarly Méi Roku Sha, or Society of the Sixth Year of Méiji (1874). On the thirtieth anniversary of the Emperor's accession to the throne, Fukuzawa, having steadfastly declined all offers of Government office as well as a title of nobility, proudly remaining a commoner, was honored by the Emperor with a gift of 50,000 yen. He died February 3, 1901. Consult Chamberlain, *Things Japanese* (London, 1891).

FULAH, fo͞o′lȧ (or *Pulo*, plural *Fulbe*). An important Hamite-Negro people on the upper Senegal River in "Futa Toro and Futa Jallon in compact masses; elsewhere in scattered groups from Senegambia east to Darfur, and south to Adamawa." They are of good stature (1.75 m.) and light brown or copper color, having long heads (index 74.3), Caucasoid features, black and frizzled, but not wooly, hair, and negroid speech. There are four great branches of the Fulah, the *Jel*, the *Baa*, the *So*, and the *Beri*, and many tribes in each. Their name undergoes many changes in the mouths of their neighbors, being variously known as Fula (Mandingan), Fulaji, Fellani (Hausa); Fulata, Fellata (Kanuri); Fullan (Arab); Ufut, Ifulan (Southern Tuaregs); Afellen, Ifellen (Northern Tuaregs); Peul, Poul (French); Fulah (English). In the term Fulah-Zavdeh are sometimes included all peoples resulting from the mixing of Ethiopians with Sudanese Negroes, extending from east to west across the whole of Africa over a belt of five to six degrees in width.

FULBERT, fu̇l′bâr′ (c.950-1029). A French bishop and scholar. He was a charity student in the school at Rheims under Gerbert, and afterwards was connected with the Church of Chartres. Here he taught, and under his direction the schools of the Academy of Chartres attained a

European reputation. In 1007 he was elected Bishop of Chartres. He caused the burned cathedral to be rebuilt (1020), and part of the present edifice dates from his episcopate. He was an active participant in the political affairs of the time, and was on intimate terms with King Robert. The correspondence of Fulbert has been published in volume 141 of the *Patrologiæ Cursus Completus* of Migne, and is contained in his *Opera Omnia* (1853). It is a valuable history of those days, and shows the bishop himself to have been a man of much character and piety.

FUL'CO, or FOULQUES, fo͞olk, of Neuilly. A famous pulpit orator of the twelfth century, the preacher of the Fourth Crusade. His early life was careless, and his ignorance brought him into contempt in his parish of Neuilly, just outside the walls of Paris. A change came over him, however, and he became an austere ascetic. He commenced a series of journeys as a preacher, exhorting to repentance, and by the rigor of his asceticism enforcing his sermons. His eloquence was so great that as he passed through the villages the people prostrated themselves, confessing their sins and protesting their intention of leading new lives and expiating the sins they had committed. He began to preach the Crusade in 1198. In 1201 he asserted that he had induced 200,000 to accept the Cross. He did not live to hear of the result, for he died at Neuilly, March, 1202. Consult Villehardouin, *La conquête de Constantinople,* edited by Wailly (Paris, 1874).

FULDA, fu̥l'dȧ. The capital of a circle in the Prussian Province of Hesse-Nassau, situated on the river Fulda, 69 miles by rail northeast of Frankfort (Map: Prussia, C 3). The most prominent buildings are the noble cathedral erected at the beginning of the eighteenth century, and containing the remains of Saint Boniface; the Church of Saint Michael, consecrated in 822; the old palace of the prince-bishops; the former Benedictine convent, now occupied by a theological seminary; and the provincial library with about 70,000 volumes. The Catholic gymnasium of Fulda is believed to be the oldest establishment of its kind in Germany. The manufactures include different kinds of textiles, plush, leather, metal goods, farm machinery, musical instruments, vinegar, and many other important products. Fulda is an important cattle market. Population, in 1890, 13,000; in 1900, 16,900. The town figures in religious history, being especially identified with the life of Saint Boniface, who founded an abbey here in 744. In the eighteenth century it was the seat of a university. It has belonged to Prussia since 1866.

FULDA, Monastery of. One of the most famous of the Benedictine abbeys in Germany. It was founded in 744 by Boniface, the apostle of Germany, who desired to establish headquarters for further missionary efforts in a safe and central spot. This was discovered on the banks of the Fulda, in the depths of the forest near the present city of Cassel. A grant of the spot, with four miles of surrounding territory, was obtained from Karlmann, son of Charles Martel. Boniface superintended the clearing of the ground and erection of the building, while his disciple Sturmius, destined to be the first abbot, spent a year in Italy, visiting the monasteries, and studying the mode of life pursued at the celebrated Benedictine convent of Monte Cassino. The abbey soon became a centre of education and civilization for the surrounding tribes, and for centuries maintained its position as a place of learning, to which, for example, Alcuin looked for help in his great educational schemes. Many privileges were given to it; in 968 the abbot was made primate of the abbeys of Germany. He was later made a prince of the Empire, with the right of sitting on the Emperor's left while the Elector of Mainz took the right. But with the advance in influence and wealth there was an increasing corruption in many of the monasteries, and from this Fulda did not escape. At the beginning of the eleventh century a reform was attempted by substituting new monks from Scotland for the old, and reëstablishing in all its strictness the Benedictine rule. The Reformation of the sixteenth century brought discord into the community; but Balthasar von Dermbach (abbot 1570-1606) effected the suppression of the new doctrines. Abbot Schenk von Schweinsberg (1623-32) completed the work of reformation, supported by Pope Urban VIII. In 1626 he brought seventeen monks from Saint Gall to set a good example. The troubles of the Thirty Years' War and dissensions between the noble and middle-class monks threatened the peace of the abbey; but with the election of Joachim von Gravenegg, in 1654, it entered upon a new period of prosperity. Benedict XIV., in 1752, created the Abbot Prince Bishop of Fulda. The diocese was secularized in 1802, to be restored, with somewhat different boundaries, in 1829. The buildings of the old monastery were occupied by a clerical seminary, which was one of the first points of attack in the *Culturkampf* of 1874. Consult: Arnd, *Geschichte des Hochstifts Fulda* (Frankfort, 1862); Hartmann, *Zeitgeschichte von Fulda* (Fulda, 1895).

FULDA, Ludwig (1862—). A German dramatic author, born at Frankfort-on-the-Main. He studied at Heidelberg, Berlin, and Leipzig, and in 1882 obtained a prize in competition by his one-act verse comedy, *Die Aufrichtigen* (1883). After the appearance of a series of comedies, including *Ein Meteor* (1887) and *Die wilde Jagd* (1888), he assumed the manner of the so-called Berlin School of Realism. In 1893 he won the Schiller prize with his *Der Talisman* (1892), but the Emperor refused to approve the award. Subsequent works are *Jugendfreunde* (1897) and *Die Zwillingsschwester* (1901), an English version of which by Louis N. Parker was presented in America. Fulda's verses are distinguished by their epigrammatic wit and his plays are skillfully contrived. He translated Rostand's *Les Romanesques* and *Cyrano de Bergerac.*

FULGENTIUS, fŭl-jĕn'shĭ-ŭs, Fabius Planciades (c.480-c.550). An African grammarian, of whose life and personality nothing is known save from internal evidence. His style is typically African. Besides a *Liber de Ficticiis Poetarum* and *Liber Physiologus,* both now lost, he wrote: *Mythologicon Libri III.,* with etymological explanations after the manner of Martianus Capella; *Expositio Vergilianæ Continentiæ,* which interprets the Æneid allegorically; a history, *De Ætatibus Mundi;* and the very untrustworthy *Expositio Sermonum Antiquorum,* which contains many fictitious quotations. Helm edited *Fulgentii Opera* (1898). His relative Fulgentius (468-

533), Bishop of Ruspe, is not to be confused with him.

FULGENTIUS, Saint, of Ruspe (468-533). A Latin Christian Father. He was born at Telepte, Northern Africa, of senatorial family. He received a good education, and became first procurator of his province. Disturbed by the turbulence of the times, he retired to a monastery near Telepte. Persecution drove the monks elsewhere, and Fulgentius went to Rome in 500. Returning to Africa, he founded a monastery. He was made Bishop of Ruspe in 508. About 510 he was banished, and again in 515, and suffered other persecutions from the Vandal King Thrasimund (496-523). On the death of the King he was recalled and passed his later years in peace. He died at Ruspe, January 1, 533, and is commemorated on that day by the Roman Church. Fulgentius was an ardent admirer of monasticism and a rigorous ascetic; he was recognized as one of the ablest defenders of Christianity against Arianism and Pelagianism. His works are in Migne, *Patrol. Lat.*, lxv. His life by his pupil, Fulgentius Ferrandus (c. 540), is contained in Migne, *Patrol. Lat.* lxvii. His letters have been edited by Hurter (Innsbruck, 1884). Consult: Mally, *Das Leben des heiligen Fulgentius* (Vienna, 1885); Victor, Bishop of Vita, *Historia Persecutionis Africanæ Provinciæ* (Vienna, 1884), German translation by A. Mally, *Verfolgung der afrikanischen Kirche durch die Vandalen* (ib., 1884).

FULGURITE, fŭl′gû-rīt (from Lat. *fulgur*, lightning, from *fulgere*, to flash; connected with *flagare*, to blaze). A name given to tubes or pipes found in rocks and sands, and formed by the actual fusion of these materials by lightning. Such tubes may have a diameter of from one to two inches at the surface, but as they descend in a vertical or oblique direction they branch and rapidly lessen in size. They are commonly found in such regions as are visited by frequent and violent storms, often on mountain peaks.

FULHAM, fụl′am. A metropolitan borough of London, England, formerly a suburban village, six miles southwest of Saint Paul's Cathedral, on the left bank of the Thames, opposite Putney, with which it is connected by two bridges (Map: London, E 6). Its distinction dates from the reign of Henry VII., when it was chosen as the summer residence of the Bishop of London. The episcopal palace, an extensive brick building, parts of which date from the sixteenth century, stands in fine grounds girded by a moat, one mile in circuit, and there are numerous fine mansions and residences in its neighborhood. The parish church, restored in 1881, with a picturesque perpendicular tower of the fourteenth century, contains the tombs of several bishops of London, and other celebrities. The borough maintains electric lighting, public libraries, baths, hospitals, and charitable institutions. Population of borough, in 1891, 189,073; in 1901, 249,534.

FULK, FULC, or **FOULQUES.** The name of several counts of Anjou. Fulk II. (938-58), called "the Good," is remembered for his saying that "An illiterate king is a crowned ass." Fulk III., called "the Black" (972-1040), became count in 987. He was a successful and indefatigable warrior, but was renowned chiefly for his repeated pilgrimages to the Holy Land, whither he went as a penance for his many crimes. Fulk V., called "the Young" (1090-1142), became count in 1109. In 1129 he went to Jerusalem to which he had already made one pilgrimage. Almost immediately upon his arrival he married Melisande, the daughter of King Baldwin II. of Jerusalem; in fact, he had been sent for this purpose. In 1131 he succeeded his father-in-law as King, and reigned very successfully until 1143. See *L'art de vérifier les dates*, vol. ii. (Paris, 1784); Röhricht, *Geschichte des Königreichs Jerusalem* (Innsbruck, 1898).

FULKE, William (1538-89). A Puritan controversialist. He was born in London, graduated from Cambridge, and began the study of law, but gave it up for theology. He became fellow of his college (Saint John's) in 1564, rector of Warley and Dennington in 1569, and master of Pembroke Hall, Cambridge, 1578. He was a Puritan of the most extreme type and particularly delighted in controversy. He made fierce attacks on the Roman Catholics. His *Defense of the Sincere and True Translations of the Holy Scriptures into the English Tongue Against the Cavils of Gregory Martin* (1583); *Stapleton's Fortress Overthrown* (1580); *Rejoinder to Martiall's Reply Against the Answer of Martin Calfhill* (1580); and *Discovery of the Dangerous Rock of the Popish Church* have been reprinted by the Parker Society, with a memoir (Cambridge, 1843-48).

FUL′LER, Andrew (1754-1815). An English Baptist minister, controversial writer, and promoter of foreign missions. He was born at Wicken, Cambridgeshire, February 5, 1754. He received the rudiments of an education at the free school of Soham, and in 1775 was chosen pastor of the Baptist congregation of that place. In 1782 he removed to Kettering, Northamptonshire, to take the pastorate of a congregation there, and remained there till his death, May 7, 1815. His first interest in foreign missions was shown in 1784, and his sermon, *The Gospel of Christ Worthy of All Acceptation* (Northampton, 1785), greatly impressed Carey, the first Baptist missionary.

When the Baptist Missionary Society was formed at Kettering in 1792, he became its secretary, and gave the remainder of his life to its affairs. His writings were very popular; they include: *The Calvinistic and Socinian Systems Examined and Compared as to Their Moral Tendency* (1794); *The Gospel Its Own Witness* (1799); *Expository Discourses on Genesis* (1806); *An Apology for the Late Christian Mission to India* (1808). There are several collected editions of his works. For his biography, consult: Rylands (London, 1816); T. E. Fuller (London, 1863); and A. G. Fuller (London, 1882).

FULLER, Arthur Buckminster (1822-62). An American Unitarian clergyman. He was born at Cambridgeport, Mass., graduated at Harvard College in 1843, and studied theology in the Harvard Divinity School. He was a teacher and preacher in Illinois, and pastor at Manchester, N. H., Boston and Watertown, Mass. He volunteered in the Federal Army in the Civil War, was made champlain in a Massachusetts regiment, and at Fredericksburg was killed by a sharpshooter. He was a brother of Margaret Fuller (Marchioness d'Ossoli), and edited several of her works (1855). Consult: R. E. Fuller (his brother), *Life of Arthur B. Fuller* (Boston, 1863), and a sketch by Higginson in *Harvard Memorial Biographies*, vol i. (Cambridge, Mass., 1866).

FULLER, George (1822-84). An American figure, portrait, and landscape painter. He was born at Deerfield, Mass., in 1822. He showed a talent for art at an early age. From 1836 to 1838 he was in Illinois with a party of civil engineers, and was associated with Henry Kirke Brown, the sculptor. Returning to Deerfield, he completed his education in four years, giving considerable attention to portrait painting. In 1842-43 he studied with Brown in Albany. He spent several years in Boston, portrait painting, then removed to New York, and continued his studies at the Academy. He was elected associate of the National Academy in 1857, upon an exhibition of a portrait of his first master, Henry Kirke Brown. He went South for three years, making many studies of negro life. In 1860 he went to Europe. He returned to Deerfield, where he combined his interests as an artist and farmer. His later works show his keen appreciation of nature. In 1876 he exhibited fourteen pictures in Boston which were received with enthusiasm. This was followed by frequent exhibitions at the Academy. In 1879 Mr. Fuller showed the "Romany Girl," and "She Was a Witch." In 1880, the "Quadroon"; and in 1881, the loveliest of all his works—the "Winifred Dysart." "Turkey Pasture in Kentucky" is one of his finest examples. The subjects of Fuller's pictures are extremely simple, conceived in a pictorial spirit. His landscapes are not so much definite pictures of localities as idealized studies of color, light, and foliage, with a poetic expression of sun and shadow. His color is soft and rich, expressed in broad, simple masses. He was a great draughtsman. He preserved all the large lines of form, sacrificing the minor details to the beauty of the whole. The essence of his art was selection. Fuller was the forerunner of a new tendency in art, that of the Idealistic School.

FULLER, Henry Blake (1857—). An American novelist and story-writer, born in Chicago. His first story, *The Chevalier of Pensieri-Vani*, was published anonymously, won favor in the eyes of Professors Norton and Lowell, and, on its republication (1892), became popular. In the same year appeared *The Chatelaine of La Trinité*. Both were remotely romantic. *The Cliff Dwellers* (1893) was an essay in relentless realism. This picture of Chicago life was followed by another, *With the Procession* (1895), kindlier in touch, with humor playing over its seriousness, and *Sicilian Romance* (1900). He has also written twelve one-act plays collected in *The Puppet Booth*.

FULLER, Loie. An American actress, noted for her invention of the 'Serpentine Dance.' She was born near Chicago, and as a child appeared at the Academy of Music there. Subsequently she appeared in a variety of characters (including Ustane in *She*) before devoting herself to her specialty. She has in recent years resided chiefly in Paris, where she has appeared at the Folies-Bergère, and in 1900 in a theatre of her own.

FULLER, Melville Weston (1833—). An eminent American jurist, a Chief Justice of the Supreme Court of the United States. He was born in Augusta, Me., graduated at Bowdoin College in 1853, studied at the Harvard Law School, began legal practice at Augusta in 1855, and was also there for a time an associate editor of *The Age*, a Democratic newspaper. In 1856 he was president of the Augusta Common Council and city attorney, but in the same year resigned his offices and established himself at Chicago, Ill., where he continued to practice law until 1888. He was a member of the Illinois State Constitutional Convention of 1862, and in 1863 sat in the Lower House of the Illinois Legislature. In 1864, 1872, 1876 (when he placed T. A. Hendricks in nomination), and 1880, in which year he withdrew from active politics, he was a delegate to the Democratic National Convention. As a lawyer he attained prominent rank. Among the principal cases argued by him were the Cheney ecclesiastical case, in which he defended C. E. Cheney, a Protestant Episcopal clergyman, and rector of Christ Church, Chicago, against the attempted action of an ecclesiastical council, and the Lake-front case, in which he represented the municipality of Chicago. In 1888 he was appointed by President Cleveland Chief Justice of the United States Supreme Court, to succeed M. R. Waite (q.v.), deceased. His term witnessed an expansion of the Federal powers by means of the decision asserting the implied authority of the Executive to protect the Federal judges on occasions when there is just reason to believe that, while in the exercise of official duties, they are exposed to personal danger. In 1899 he was a member of the Arbitration Commission convened at Paris for the adjustment of the Anglo-Venezuelan boundary question. An address by him on Sidney Breese may be found in Breese's *Early History of Illinois* (1884). The degree of LL.D. was conferred upon him by Harvard in 1891.

FULLER, Richard (1804-76). An American clergyman. He was born in Beaufort, S. C., studied at Harvard, was admitted to the bar, and subsequently entered the Baptist ministry. From 1846 until his death he was pastor of the Seventh Baptist Church in Baltimore. He published *Letters on the Roman Chancery; Correspondence on Domestic Slavery;* and *Baptism and Communion.* Consult Cuthbert, *Memoir of Richard Fuller* (New York, 1879).

FULLER, Sarah Margaret (Ossoli) (1810-50). An American critic and essayist, born at Cambridgeport, Mass., May 23, 1810. The eldest of the eight children of Timothy Fuller, a Massachusetts lawyer and politician, she was strenuously educated by her father, by Dr. Park of Boston, and in the Misses Prescott's School at Groton, beginning Latin at six and Greek at thirteen, and permanently injuring her health by over-application. On the death of her father (1835) she supported her brothers and sisters by public and private teaching in Boston and Providence. She was a frequent guest at Brook Farm, though never sharing its enthusiasms, held intellectual conversations in Boston, conducted the Transcendental organ, *The Dial* (1840-42), made translations from the German, and published in 1844 her first volume, *Summer on the Lakes*, the record of a season of travel in 1843. In December (1844) she went to New York as literary critic of the *Tribune*, taking active part in the philanthropic, literary and artistic life of the city. In 1846 she went to Europe, where she was received by social, political, and literary leaders, residing for some time at Rome, where she married (December, 1847) Giovanni Angelo, Marquis d'Ossoli, by whom she had one child. She took an active part in the Italian struggle for independence, and served heroically in the hospitals during the French siege of Rome. On its capture (July, 1849) she took refuge with her husband first in the mountains of Abruzzi, then at Florence, and on May 17, 1850, sailed for America. The voyage was most disastrous. The captain died of smallpox, her son was taken with the disease, and she and her husband and son were drowned off Fire Island Beach just as they were approaching New York on July 16.

Her life falls naturally into three periods. Till 1844 she lived an intense life seeking self-culture in the exciting stimulation of the Transcendental circle. The two years from 1844 till her visit to Italy are those of original literary production. *Women in the Nineteenth Century* (1844) and *Papers on Literature and Art* (1846) are its monuments. Her activities in Rome had found a literary expression in a book on the Roman Republic, the manuscript of which was lost with her. With all her tact and brilliancy, she was not an original genius; she needed the inspiration of an audience, talking better than she wrote. Her *Letters* are, therefore, the most readable of her works, and the position that she held in Boston and in New York is hardly to be understood from her writings. It was a natural instinct that led her to select for translation Eckermann's *Conversations with Goethe* (1839), and *The Correspondence of Fräulein Günderode and Bettina von Arnim* (1840-42). The impression that she made upon the circle of her intimates is attested by three notable biographies, for which consult: Emerson, Clark, and Channing (Boston, 1852); Julia Ward Howe (ib., 1883); and Thomas Wentworth Higginson (ib., 1884). There is also a *Memoir* by her brother, Arthur B. Fuller (Boston, 1855).

FULLER, THOMAS (1608-61). An English author and divine. He was born at Aldwincle, Northamptonshire, of which parish his father was rector, and was educated at Queen's College, Cambridge, graduating A.B. in 1625 and M.A. in 1628. Two years later he was appointed to the curacy of Saint Benet's, where he acquired great popularity as a preacher. The next year he was collated to a prebend in Salisbury Cathedral, and in 1634 he was appointed to the rectory of Broadwindsor, Dorsetshire. His first publication was a poem entitled *David's Heinous Sin; Hearty Repentance and Heavy Punishments* (1631). Abandoning both his living and his prebend in 1641, he settled in London, where he soon became curate of the Savoy, a church in the Strand. In the meantime he had published an account of the Crusades, entitled *History of the Holy War* (1639), and the *Holy and Profane State* (1642), the most characteristic of his works. During the Civil War he adhered firmly to the Royal cause, and shared in its reverses. He was a chaplain in the Royal army, when he wrote for the encouragement of his men a manual of prayers and meditations entitled *Good Thoughts in Bad Times* (1645), and a sequel, *Better Thoughts in Worse Times* (1647). In 1647 he was preaching at Saint Clement's, Eastcheap, but was soon suspended. About 1648 he was presented to the living of Waltham, in Essex. In 1650 he published a geographical account of the Holy Land, entitled *A Pisgah Sight of Palestine and the Confines Thereof,* with maps and views. In 1655 appeared *The Church History of Britain, from the Birth of Christ Until the Year 1648.* In 1658 he received the living of Cranford, Middlesex, and at the Restoration he was reinstated in his prebend of Salisbury, of which he had been deprived by the Parliamentarians. He was also appointed Chaplain Extraordinary to the King, and created D.D. at Cambridge by Royal mandamus. He died in London. The year following appeared *The Worthies of England.* Valuable for the information it contains on provincial history, it abounds in biographical anecdote, witty remark, and acute observation on men and manners. Quaint humor is one of Fuller's peculiar characteristics; but his writings are no less remarkable for wisdom, imagination, and, when occasion demands, even for pathos. Consult Bailey, *Life of Thomas Fuller, with Notices of his Books,* etc. (London, 1874).

FULLER-MAITLAND, JOHN ALEXANDER (1856—). An English writer on music, born in London. He graduated at Trinity College, Cambridge, in 1879, and, after having contributed for a number of years to the London papers, became in 1889 music critic of the *Times.* He wrote many articles for the *Dictionary of National Biography,* for Grove's *Dictionary of Music and Musicians* (the appendix of which he edited), and for some of the leading periodicals. He also wrote a standard life of Schumann in the Great Musicians Series (1884); *Master of German Music* (1894); *The Musician's Pilgrimage: A Study in Artistic Development* (1899); and was joint translator with Clara Bell of Spitta's *Life of J. S. Bach* (1884). In addition he compiled a number of collections of music.

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